



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

WIDENER LIBRARY



HX HK87 G

V.3363

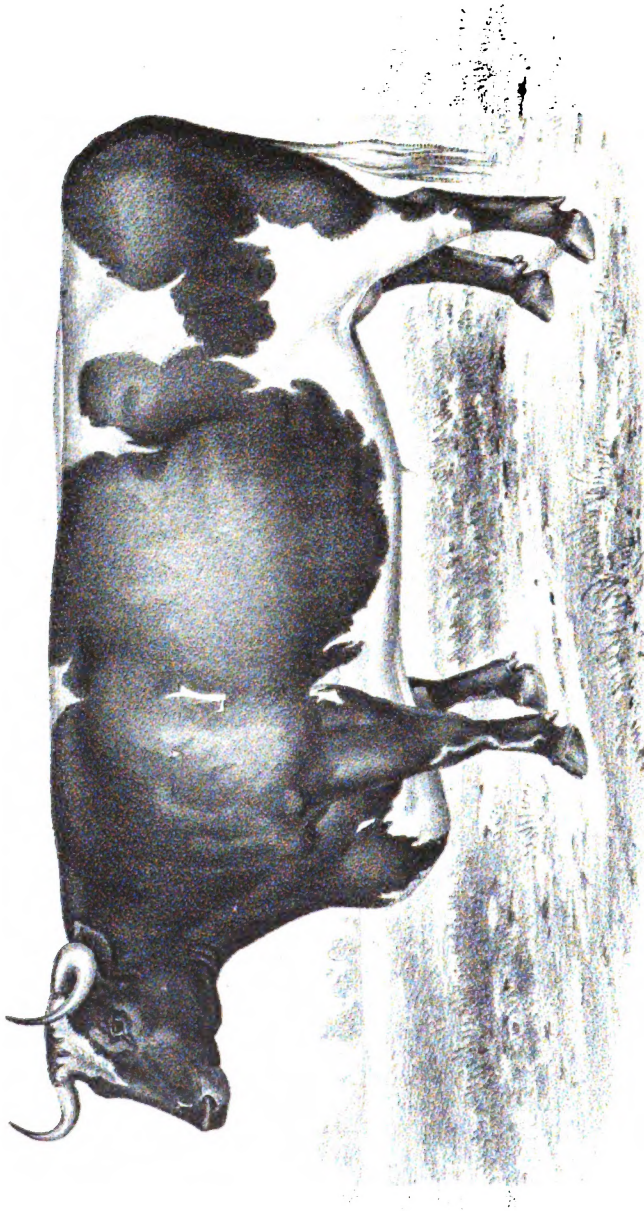


Harvard College Library

FROM

the state library.

16 May, 1896.



PRINCE.

Fed by JASON SEXTON, Member of the State Board of Agriculture, Spring House, Montgomery Co., Pa.
(Weight, 3850 Pounds.)

THE COMMONWEALTH OF PENNSYLVANIA.

AGRICULTURE OF PENNSYLVANIA.

CONTAINING

REPORTS

OF THE

STATE BOARD OF AGRICULTURE,

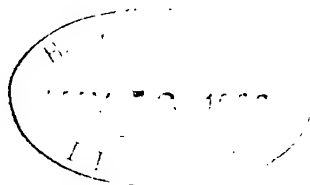
THE

STATE AGRICULTURAL SOCIETY, THE STATE DAIRY-
MEN'S ASSOCIATION, THE STATE HORTICUL-
TURAL ASSOCIATION, AND THE STATE
COLLEGE.

FOR 1893.

CLARENCE M. BUSCH,
STATE PRINTER OF PENNSYLVANIA.
1893.

I, 3363
(C I, 262)



The State Library
C



EXTRACT FROM THE ACT OF APRIL, 16, 1887.

“Section 1. *Be it enacted, etc.,* That from and after the passage of this act the printing, binding and distribution of the several public documents of this Commonwealth shall be as follows:

* * * * *

“Section 15. Thirty-one thousand five hundred and ten (31,510) copies of the work entitled the “Agriculture of Pennsylvania,” in the style, manner and form prescribed by law; eight thousand for the Senate, twenty thousand for the House of Representatives, one thousand five hundred for the State Board of Agriculture, five hundred for the State Agricultural Society, five hundred for the State Dairymen’s Association, three hundred for the State Horticultural Association, fifty for the State College, one hundred for the Governor, sixty for the State Librarian for distribution and exchange with states and territories, and five hundred for reserve work.”

OBITUARY.

JOHN NICHOLS.

Born March 19th, 1833.

Died April 5th, 1893.

John Nichols, late member of the State Board of Agriculture from Westmoreland county, was born at Greensburg, Westmoreland county, Pa., March 19th, 1833. His early life was spent on the farm, and he there imbibed that love of animals which so strongly characterized his future life, and which led him to state in one of his recent agricultural addresses that "we love the horse above all other animals, for his constancy, affection, kindness and intelligence. He has been our companion from infancy and is yet so in our old age."

Shortly after the breaking out of the rebellion he entered the army, and while at Camp Howe, near Pittsburgh, was elected the first lieutenant of his company. He was afterwards commissioned quartermaster of the One Hundred and Sixty-eighth regiment, by Governor Curtin. He was honorably discharged July 25, 1863, and, returning home with his regiment, entered into the nursery business near Latrobe, Pa.

In 1882, he removed to the farm on which he died, near Bradenville, Westmoreland county, and, resuming the peaceful duties of farm life, remained thus engaged until his death.

At the time of his death he was an ordained deacon in the Presbyterian church, member of the State Board of Agriculture, a school director, and an active member of the Westmoreland County Agricultural Society.

SEVENTEENTH ANNUAL REPORT
OF THE
Pennsylvania State Board of Agriculture.
FOR THE YEAR 1893.

MEMBERS EX-OFFICIO.

Hon. R. E. Pattison, *Governor.*
Hon. T. J. Stewart, *Secretary of Internal Affairs.*
Dr. N. C. Schaeffer, *Superintendent of Public Instruction.*
Gen. D. McM. Gregg, *Auditor General.*
Dr. G. W. Atherton, *President Pennsylvania State College.*
Thos. J. Edge, *Secretary State Board of Agriculture.*

APPOINTED BY THE GOVERNOR.

	Term expires.
Col. James Young, Middletown, Dauphin county,	1894
Hon. S. R. Downing, Goshenville, Chester county,	1895
Hon. Will B. Powell, Shadeland, Crawford county,	1896

ELECTED BY COUNTY AGRICULTURAL SOCIETIES.

		Term expires.
Adams,	I. Garretson,	Biglersville, 1894
Allegheny,	W. H. McCullough,	Tarentum, 1894
Armstrong,	D. W. Lawson,	Dayton, 1896
Beaver,	E. S. Weyand,	Beaver, 1896
Bedford,	S. S. Diehl,	Bedford, 1894
Berks,	G. D. Stitzel,	Reading, 1895
Bradford,	Louis Piolet,	Wysox, 1895
Blair,	Fredrick Jaekel,	Hollidaysburg, 1895
Bucks,	E. Reeder,	New Hope, 1896
Butler,	W. H. H. Riddle,	Butler, 1894
Cambria,	J. J. Thomas,	Carrolltown, 1895
Centre,	John A. Woodward,	Howard, 1894
Chester,	Dr. J. P. Edge,	Downingtown, 1896
Clarion,	W. Shanafelt,	Brinkerton, 1895

Term expires.

Clearfield,	E. M. Davis,	Grampian Hills,	1894
Clinton,	J. A. Herr,	Cedar Springs,	1896
Columbia,	Chandlee Eves,	Millville,	1894
Crawford,	Luther Gates,	Beaver Center,	1895
Cumberland,	C. H. Mullin,	Mt. Holly Springs,	1894
Dauphin,	G. Hiester,	Harrisburg,	1894
Erie,	A. L. Wales,	Corry,	1895
Fayette,	G. Hopwood,	Uniontown,	1894
Franklin,	D. Z. Shook,	Greencastle,	1896
Fulton,	D. H. Patterson,	Webster Mills,	1895
Greene,	B. F. Herrington,	Waynesburg,	1895
Huntingdon,	G. W. Musser,	Fillmore,	1894
Indiana,	N. Seanor,	Plumville,	1895
Jefferson,	J. McCracken, Jr.,	Frostburg,	1896
Juniata,	D. E. Robison,	Port Royal,	1894
Lackawanna,	H. H. Colvin,	Dalton,	1894
Lancaster,	C. Cooper,	Bird-in-Hand,	1895
Lawrence,	S. McCreary,	Neshannock Falls,	1894
Lebanon,	C. R. Lantz,	Lebanon,	1894
Lehigh,	J. P. Barnes,	Allentown,	1894
Luzerne,	W. P. Kirkendall,	Dallas,	1896
Lycoming,	A. Fague,	Picture Rocks,	1894
Mercer,	Robert McKee,	Mercer,	1896
Mifflin,	J. B. Shaanon,	Lewistown,	1895
Monroe,	Randall Bisbing,	Minsi,	1896
Montgomery,	Jason Sexton,	Springhouse,	1896
Montour,	T. L. Clapp,	Limestoneville,	1895
Northampton,	B. B. McClure,	Bath,	1894
Northumberland,	John Hoffa,	Milton,	1896
Perry,	D. Kistler,	Kistler,	1894
Somerset,	N. B. Critchfield,	Jenner's X Roads,	1895
Sullivan,	J. K. Bird,	Millview,	1894
Susquehanna,	R. S. Searle,	Montrose,	1895
Tioga,	P. D. Rexford,	Mansfield,	1896
Union,	J. A. Gundy,	Lewisburg,	1896
Venango,	Porter Phipps,	Kennerdell,	1895
Warren,	Charles Lott,	Warren,	1895
Washington,	J. McDowell,	Washington,	1896
Wayne,	N. F. Underwood,	Lake Como,	1895
Westmoreland,	J. Nichols,*	Bradenville,	1895
Westmoreland,	W. C. Sloan†,	Sloan,	1895
Wyoming,	N. G. Bunnell,	Vosburg,	1894
York,	W. S. Roland,	York,	1895

* Died April 5, 1893.

† Elected May 15, 1893.

OFFICIAL LIST.

President.

Hon. R. E. Pattison, *Governor.*

Vice Presidenta.

S. R. Downing,

Hon. N. Seanor,

W. H. H. Riddle.

Executive Committee.

Hon. R. E. Pattison,
C. Cooper,
Col. James Young,

B. B. McClure,
J. McDowell,
Joel A. Herr,
T. J. Edge, *Secretary.*

S. McCreary,
W. S. Roland,
G. Hiester,

Advisory Committee.

C. Cooper,

Joel A. Herr,
Thos. J. Edge, *Secretary.*

G. Hiester,

Secretary,

Thos. J. Edge, Harrisburg.

Botanist.

Thos. Meehan, Germantown.

Pomologist.

Cyrus T. Fox, Reading.

Chemist.

Dr. Wm. Frear, State College.

Veterinary Surgeon.

Dr. F. Bridge, Philadelphia.

Sanitarian.

Dr. G. G. Groff, Lewisburg.

Microscopists and Hygienists.

Dr. H. Leffman, Philadelphia,

Prof. C. B. Cochran, West Chester.

Entomologist.

Ornithologist.

Dr. B. H. Warren, West Chester.

Small Fruit Culturist.

Prof. S. B. Heiges, York.

Meteorologists.

J. I. Heacock, Quakertown,

Maj. Frank Ridgway, Harrisburg.

Mineralogist.

Joseph Willcox, Philadelphia.

Apiarist.

Dr. G. G. Groff, Lewisburg.

Geologist.

Prof. J. P. Lesley, Philadelphia.

Stenographer,

Joseph F. Cummings, Sunbury.

STANDING COMMITTEES—1893.

LEGISLATION.

Hon. N. B. Critchfield, *Chairman*,
Dr. B. H. Warren,
D. H. Patterson.

Hon. J. J. Thomas,
G. Hiester,

Hon. N. Seanor,
Hon. J. A. Woodward.

FORESTS AND FORESTRY.

Dr. W. S. Roland, *Chairman*,
J. J. Thomas,
N. F. Underwood,

Prof. Thos. Meehan,
E. M. Davis,
D. H. Patterson,

Prof. J. T. Rothrock,
D. Kistler,
N. Seanor.

CEREALS.

D. H. Patterson, *Chairman*,
J. A. Herr,
H. H. Colvin,

N. B. Critchfield,
S. McCreary,
B. B. McClure,

Porter Phipps,
D. W. Lawson,
G. Hopwood.

BIRDS AND MAMMALS.

Dr. B. H. Warren, *Chairman*,
G. Hopwood,
N. B. Critchfield,

Louis Piolett,
Geo. D. Stitzel,
N. F. Underwood,

J. J. Thomas,
A. Fague.

APIARY.

D. W. Lawson, *Chairman*,
Calvin Cooper,

John Nichols,

N. B. Critchfield.

WOOL AND TEXTILE FIBERS.

John McDowell, *Chairman*,
David B. Heiner,
J. A. Woodward,

Theodore Justice,
N. B. Critchfield,
J. McCracken, Jr.,

Noah Seanor,
G. Hopwood,
John Nichols.

LIVE STOCK.

Wm. Shanafelt, *Chairman*,
J. Nichols,
R. S. Searle.

Joel A. Herr,
A. Fague,
E. M. Davis,

S. McCreary,
M. W. Oliver.

POULTRY.

Luther Gates, *Chairman*,
Robert McKee,
B. F. Herrington,

John Hoffa,
John Nichols,
B. B. McClure,

J. B. Shanuon,
E. M. Davis,
S. S. Diehl.

ROADS AND ROAD LAWS.

Hon. S. R. Downing, *Chairman*,
W. Shanafelt,
B. B. McClure,

Calvin Cooper,
N. Seanor,
J. A. Herr,

J. P. Barnes,
G. Hiester.

DAIRY AND DAIRY PRODUCTS.

Eastburn Reeder, *Chairman*,
Luther Gates,
Dr. Henry Leffman,

N. F. Underwood,
N. B. Critchfield,
Prof. C. B. Cochran,

J. A. Herr,
I. Garretson,
S. McCreary.

ENSILAGE AND CORN FODDERS.

Jason Sexton, *Chairman*,
Louis Piolett,
G. Hiester,

A. L. Wales,
B. B. McClure,

I. Garretson,
J. A. Gundy.

FRUIT AND FRUIT CULTURE.

Geo. Hopwood, *Chairman*,
C. T. Fox,
S. B. Heiges,
C. Cooper,
J. A. Herr,

H. C. Snively,
C. Hiller,
J. Nichols,
E. B. Engle,
F. Jaekel,

J. E. Jamison,
E. O. Brinser,
A. C. Sisson,
G. Hiester,
D. Z. Shook.

PRINCE.

(See frontispiece.)

The celebrated steer, Prince, was calved April 1, 1886, at Iona, Michigan; his sire was the Holstein-Fresian bull Prince Christian (No. 665); his dam was a pure bred Polled Durham cow of the Duchess strain, large in size, weighing 1,700 pounds when in low flesh. He was shipped to Buffalo for sale as beef in February, 1890, and was there bought by John Ridey, of Philadelphia, for beef. After examining the animal, Mr. Ridey was convinced that, if properly cared for, he would still gain greatly in size and weight, and, in partnership with Jason Sexton, member of the Board of Agriculture from Montgomery county, it was decided to feed him and thus ascertain what could be made out of him.

He was sent to the Record Farms, then under the care of Mr. Sexton, March 6, 1890, and was carefully brought up to his full feed, when he consumed one bushel of ground corn and oats (in equal parts), one bushel of potatoes, and a small amount of cake meal and a little condimental food. His average ration during the first two years was very nearly one bushel in bulk, and during his third year it averaged about three pecks.

When shipped to the Record Farms, March 6, 1890, his weight was 2,700 pounds; April 3, 1893, when he was placed upon exhibition in Philadelphia, his weight was 3,855 pounds.

His height is six feet, two inches; his girth is ten feet, nine inches, and his length from root of ear to the end of his rump is ten feet.

His gain in weight during the 1,122 days of feeding was 1,155 pounds, or an average of over one pound per day.

AN ACT

To provide for the current expenses of the State Board of Agriculture.

Section 1. *Be it enacted, etc.*, That the following sums be and are hereby specifically appropriated for the current expenses of the State Board of Agriculture for the two fiscal years commencing June 1, 1893.

For the salary of the secretary of the Board, \$2,500 per annum, or so much thereof as may be authorized by law.

For clerical assistance, salary of messenger, postage, express charges, and other necessary office expenses, one thousand five hundred dollars per annum, or so much thereof as may be necessary.

For the actual and necessary expenses of members of the Board, two thousand dollars per annum, or so much thereof as may be necessary.

For the actual and necessary expenses of local or farmers' institutes, and for the traveling expenses of the secretary, nine thousand five hundred dollars per annum, or so much thereof as may be necessary.

For the necessary expenses of preventing the spread of contagious disease (not otherwise provided for) among domestic animals, one thousand dollars per annum, or so much thereof as may be necessary.

The said appropriation to be paid on the warrant of the Auditor General on a settlement made by him and the State Treasurer upon itemized vouchers duly certified by the secretary of the State Board of Agriculture. All moneys appropriated under this act, and remaining unexpended at the close of each fiscal year, shall revert to the State Treasury.

Approved May 27, 1893.

SYNOPSIS OF THE MINUTES OF THE MEETINGS
OF THE BOARD.*

1893.

ANNUAL MEETING.

Held at Harrisburg, Penn'a, January 25 and 26, 1893.

Wednesday Morning, January 25, 1893.

Board called to order at 9.30 A. M. by Governor R. E. Pattison in the chair.

The Secretary announced that, owing to the expiration of the terms of membership of one-third of the Board, there were vacancies in the representation from the counties of Armstrong, Beaver, Bucks, Chester, Clinton, Franklin, Jefferson, Luzerne, Montgomery, Northumberland, Tioga, Union, Washington and Wyoming, and that the term of office of Hon. Will B. Powell, member-at-large, appointed by the Governor, had expired.

Present during the sessions: Hon. R. E. Pattison, Dr. G. W. Ather-ton, Colonel James Young, Hon. S. R. Downing, and Messrs. Lawson, Weyand, Diehl, Stitzel, Jaekel, Reeder, Riddle, Thomas, Woodward, Shanafelt, Davis, Herr, Eves, Gates, Mullin, Hiester, Wales, Hopwood, Shook, Patterson, Herrington, Seanor, McCracken, Colvin, Cooper, Lantz, McCreary, Barnes, Smith, Fague, McKee, Shannon, Sexton, Clapp, McClure, Hoffa, Kistler, Critchfield, Bird, Searle, Gundy, Phipps, Lott, McDowell, Underwood, Nichols, Roland, and Secretary. Of the honorary officers, Messrs. Fox, Frear, Ridgway and Warren were present.

On motion the Chair named Messrs. Barnes, Roland and Underwood a Committee on Credentials of members-elect and delegates.

On motion the Committee on Credentials were granted permission to meet during the session, and a call was made by the Chair for credentials of members-elect and delegates.

Financial report of the Secretary read and adopted by the Board.

Committee on Credentials reported that Messrs. Lawson, of Armstrong; Weyand, of Beaver; Reeder, of Bucks; Edge, of Chester; Herr, of Clinton; Bisbing, of Monroe; Sexton, of Montgomery; Mc-

* The limited space at our disposal prevents the printing of the minutes in full. This synopsis has been prepared as representing the main business transacted during the year, but does not represent the details of the work of the board.—Secretary.

Dowell, of Washington; Bunnell, of Wyoming; McCracken, of Jefferson; Gundy, of Union; Hoffa, of Northumberland, and Shook, of Franklin, were present with proper credentials as members-elect, and were entitled to membership for three years, and that John B. Smith, of Luzerne, had presented a certificate, not in proper form. The Committee advised that all those presenting proper credentials be admitted as members, and that John B. Smith be admitted as a member at this meeting, and that he present to the Secretary a proper certificate of membership before the next meeting.

The Committee also reported that they had received the credentials of a large number of delegates appointed by various agricultural and horticultural organizations.

On motion, the Board proceeded to the election of officers for 1893.

The Chair named Messrs. Critchfield, Kistler and Cooper to act as tellers of the election, and receive and count the votes cast.

Messrs. Atherton, of Centre; Seanor, of Indiana; Riddle, of Butler, and Downing, of Chester, were nominated as Vice Presidents.

The tellers reported that by the first ballot Messrs. Downing, Seanor and Riddle had been elected Vice-Presidents.

Messrs. Young, of Dauphin; McClure, of Northampton; Roland, of York; Herr, of Clinton; McCreary, of Lawrence; Gundy, of Union; Atherton, of Centre; Cooper, of Lancaster; Shanafelt, of Clarion; Kistler, of Perry; Hiester, of Dauphin, and Searle, of Susquehanna, were then nominated as members of the Executive Committee.

The tellers announced that, as the result of the first ballot, Messrs. Cooper, Herr, McClure, Roland, McCreary and Young had been elected.

Thomas J. Edge was nominated for the position of Secretary, and Mr. Gundy, of Union, directed to cast the ballot of the Board for him.

The Committee on Legislation, through Hon. N. B. Critchfield, Chairman, presented their annual report, which was read, discussed, amended and adopted.

John Patterson, of Philadelphia, presented a communication relating to the manufacture of a special fertilizer, which, on motion, was referred to a special committee consisting of Messrs. Stitzel, Gundy and Hiester.

On motion, the Board then proceeded to select a place for the spring meeting. Mr. McClure, of Northampton, presented an invitation from the Northampton County Agricultural Society for the Board to meet at Bethlehem, which, after discussion, was accepted, and the Advisory Committee directed to fix the time, after consultation with the resident member.

Dr. H. P. Armsby presented an invitation from the Pennsylvania State College for the Board to hold its October meeting at the College; after partial discussion the invitation was laid over for further consideration at the spring meeting.

The following resolution was, after discussion, adopted: "Resolved, That the Pennsylvania State Board of Agriculture asks the passage of a bill authorizing the appointment of a commission to collect all available data relative to the forestry question in Pennsylvania, and that the commission shall make a report of its work and conclusions to the Legislature of 1895."

On motion, adjourned until 2 P. M.

Wednesday Afternoon, January 25, 1893.

Board called to order at 2 P. M. by Hon. R. E. Pattison in the chair.

Dr. B. H. Warren, on behalf of the Committee on Birds and Mammals, presented the report of the Committee, which, after partial discussion, was referred to the Committee on Legislation.

B. B. McClure presented a resolution from Northampton county relative to taxation, road laws and other topics, which, after reading, was referred to the Committee on Legislation.

Hon. James A. Stranahan, Deputy Attorney General, then addressed the Board upon the subject of the "Fence Laws of Pennsylvania," and answered numerous questions from members and others present.

A. N. Greir, Esq., Secretary of the Juniata Valley Roads Improvement Association, addressed the Board upon the subject of Public Roads, and was followed by N. F. Underwood, of Wayne, and S. R. Downing, of Chester, upon topics relating to public roads, when the question of Roads and Road Laws was declared open for discussion, which was continued until the hour of adjournment.

On motion, adjourned until 7.30 P. M.

Wednesday Evening, January 25, 1893.

Board called to order at 7.30 P. M., by Governor R. E. Pattison in the chair.

Prof. H. B. Gurler, of the Pennsylvania State College Experiment Station, addressed the Board upon the subject of the New Dairy School established at the Station, and illustrated his address by numerous tables and data relating to the question, and also answered numerous questions from the audience.

Prof. J. T. Rothrock, Secretary of the Pennsylvania Forestry Association, then addressed the board upon the forestry question and its bearings upon agriculture and agricultural interests.

On motion adjourned until 9 A. M. Thursday, January 26.

Thursday Morning, January 26, 1893.

Board called to order at 9 A. M., by Hon. R. E. Pattison in the chair.

The Executive Committee reported that they had confirmed the following nominations by the Secretary for honorary officers of the board.

Botanist, Thomas Meehan, Germantown; Pomologist, Cyrus T. Fox, Reading; Chemist, Dr. Wm. Frear, State College; Veterinary Surgeon, Dr. F. Bridge, Philadelphia; Sanitarian, Dr. G. G. Groff, Lewisburg; Microscopists and Food Inspectors, Dr. H. Leffman, Philadelphia and Prof. C. B. Cochran, West Chester; Ornithologist, Dr. B. H. Warren, West Chester; Small Fruit Culturist, Prof. S. B. Heiges, York; Meteorologists, J. L. Heacock, Esq., Quakertown, and Maj. F. Ridgway, Harrisburg; Mineralogist, J. Willcox, Philadelphia; Apiarist, Dr. G. G.

Groff, Lewisburg; Geologist, Prof. J. P. Lesley, Philadelphia, and Stenographer, Jos. F. Cummings, Sunbury.

The Executive Committee also reported that they had elected Messrs. Cooper, Hiester and Herr as members of the Advisory Committee.

James G. McSparran read an essay in answer to the question, "Can fertility be maintained by the use of Commercial Fertilizers alone?" The question was discussed by Messrs. McSparran, Atkinson, Comly, Johnson, Armsby, Wales, Heiges, Reeder, Nichols, McWilliams, Phipps, Jaekel and Secretary.

Prof. S. B. Heiges illustrated the use of the Babcock Machine as a test for butter fats in milk, and answered numerous questions propounded by Messrs. Atkinson, Forney, Reeder, Eves, Nichols, Cooper, Johnson, Shanafelt, Smith and others.

Mr. Reader, of Bucks, presented a resolution relative to the enforcement of the law relating to the manufacture and sale of oleomargarine which was adopted.

On motion the question of Farmers' Institutes was then taken up and J. A. Herr, of Clinton, and Calvin Cooper, of Lancaster, read essays relating to prominent points of the institute question. The subject having been declared open for general discussion, remarks were made by Messrs. Herr, Nichols, Lawson, Kistler, McClure, Monaghan, Shanafelt, Grow, Sisson, Cooper, McCracken, Barnes, Bird, Patterson, Eves and Secretary.

On motion adjourned until 2 P. M.

Thursday Afternoon, January 26, 1893.

Board called to order at 2 P. M., by Governor R. E. Pattison in the chair.

The Secretary announced that, owing to circumstances entirely beyond his control, Dr. Leonard Pearson was unable to be present, and asked that the reading of his essay be postponed until a future meeting.

S. P. Heilman read an essay on "Hygiene Relating to Animals."

Mr. Lawson, of Armstrong, presented a series of resolutions adopted by the Armstrong County Farmers' Institute, which were, on motion, referred to the Committee on Legislation

Dr. D. J. Waller, Jr., Superintendent of Public Instruction, addressed the board in relation to "The Public Schools and the Rural Population"; the subject matter of the address was discussed by Messrs. Nichols, Hopwood, Tewksbury, Kistler, Barnhart, Lawson, Branson, Barnitz and others.

Calvin Cooper, of Lancaster, read an essay on "The Seed Bed and Crop Cultivation," which called out discussion by Messrs. Cooper, Hopwood, Eves, McCreary, Kistler, Thomas and others.

On motion adjourned until 7.30 P. M.

Board called to order at 7.30 P. M., by S. R. Downing, Vice President, in the chair.

Prof. S. B. Heiges, addressed the board upon the topic of "The Geological and Chemical Characteristics of Soils."

Adjourned to meet at Bethlehem, at the call of the Advisory Committee.

SUMMER MEETING.

Held at Bethlehem, Pa., June 14 and 15, 1893.

Wednesday Morning, June 14, 1893.

Board called to order at 9 A. M., by Governor R. E. Pattison in the chair.

Present during the sessions, Governor Pattison and members of the board, as follows:

Messrs Young, Downing, Powell, Garretson, McCullough, Lawson, Diehl, Stitzel, Piollet, Reeder, Riddle, Thomas, Shanafelt, Herr, Eves, Gates, Hopwood, Shook, Patterson, Herrington, Musser, McCracken, Robison, Colvin, Cooper, McCreary, Barnes, Smith, Kirkendall, Fague, McKee, Shannon, Bisbing, Sexton, Clapp, McClure, Hoffa, Kistler, Critchfield, Bird, Searle, Gundy, McDowell, Underwood, Sloan and Secretary.

On behalf of the citizens of Bethlehem, Hon. Paul Kempsmith, Burgess, delivered an address of welcome which was replied to on behalf of the board by Governor R. E. Pattison.

The chair named Messrs. Barnes, Underwood and Garretson as a committee to receive and report upon the credentials of members elect and delegates.

Financial report of the Secretary, for the year ending June 1, 1893, read, discussed and approved.

Law relating to the Dairy and Food Commissioner read and discussed by Messrs. McCullough, Reeder, Searle, Shook, Pattison, Hopwood and Secretary.

Committee on Credentials reported that they had received credentials in proper form from Robt. McKee, of Mercer, and W. C. Sloan, of Westmoreland, and that these gentlemen were entitled to membership of the Board, for the term of three years in the case of Mr. McKee, and for the unexpired term in the case of Mr. Sloan, he having been elected to fill the vacancy caused by the death of Mr. Nichols. The committee also reported that there was a contest in the membership from Luzerne, and requested that two members be added to the committee. The chair named Messrs McDowell and Downing as additional members.

The Committee on Credentials reported that numerous delegates were present with proper credentials from local agricultural organizations.

The Committee on Credentials subsequently reported that they found W. P. Kirkendall, properly accredited as a member from Luzerne.

Reports of the Committee on Credentials received, and the Secretary directed to pay the expenses of the contesting member from Luzerne.

J. A. Gundy, member from Union, read an essay on "The Coming Road," and J. A. Herr, of Clinton, one on "Road Making," when the road question was declared open and discussion followed in which Messrs. Herr, Young, Brown, Downing, Searle, Sloan, Hopwood, Gundy, Shook, Lawson, Kistler, Garretson, McKee, Secretary and others participated.

On motion adjourned until 2 P. M.

Wednesday Afternoon, June 14, 1893.

Board called to order at 2 P. M., by Governor R. E. Pattison in the chair.

On motion Thomas Meehan, Botanist of the Board, was invited to address the meeting in relation to the roads of Europe.

Hon. Jeremiah Hess, of Northampton, read an essay entitled "A Plea for Forestry." The act of the Legislature forming the State Forestry Commission was read, when the question of forestry was declared open for discussion, which was participated in by Messrs. Brown, Young, Hopwood, McDowell, Searle, Garretson, Powell, Critchfield, Hess, Herr, Gundy, Fague, Lawson, Rothrock, Underwood, Monaghan, McCreary and Secretary.

Prof. Thomas Meehan, Botanist of the Board, then gave an interesting address in relation to the peculiarities of seeds.

On motion the board proceeded to select a place for the usual fall meeting, when Mr. Downing named the State College; Mr. Lawson named Kittanning, and Mr. Eves named Bloomsburg. After discussion Kittanning was selected and the time for the meeting referred to the Advisory Committee and resident member.

On motion adjourned until 7. 30 P. M.

Wednesday Evening, June 14, 1893.

Board called to order at 7.30 P. M., by Governor R. E. Pattison in the chair.

Dr. J. T. Rothrock, Secretary of the Pennsylvania Forestry Association and member of the State Forestry Commission, gave an illustrated lecture on "The Relation of Forest Cover to the Surface of the Country."

Adjourned to meet at 9 A. M., Thursday, June 15, 1893.

Thursday Morning, June 15, 1893.

Board called to order at 9.45 A. M., by Governor R. E. Pattison in the chair.

Committee on Resolutions relative to the death of John Nichols, late member from Westmoreland, reported, and the chairman of the committee was directed to forward a copy of the resolutions to the family of the deceased member.

Prof. S. B. Heiges then addressed the board on "Another Year's Experience in Fruit Culture," the subject matter of which was discussed by Messrs. Cooper, Critchfield, Monaghan, Eves, Garretson, McDowell, Stitzel, Powell, Kistler, Heiges, Hopwood, Thomas, Secretary and others.

Dr. John P. Edge read an essay on "The Responsibility of the Farmer in Shaping Legislation," which called out discussion from Messrs. Hopwood, Gundy, Searle, Shook, Monaghan, Thomas, Garretson, McCreary, McKee and Secretary.

On motion adjourned until 2 P. M.

Thursday Afternoon, June 15, 1893.

Board called to order at 2 P. M., by Vice President Riddle in the chair.

Mr. Cooper, of Lancaster, offered a resolution endorsing Prof. S. B. Heiges for the vacant position of Pomologist in the National Department of Agriculture, which was unanimously adopted.

Mr. Stitzel, of Berks, read an essay on "The Necessity of Changing our System of Farming," which was discussed by members generally.

Mr. McCracken, of Jefferson, read an essay on "The Destruction of Canada Thistles," which elicited discussion on the part of Messrs. Kistler, Gundy, Herr, Searle, Sexton, McDowell, Garretson and others.

Mr. Sexton, member from Montgomery, read an essay on "Raising Early Lambs for Market."

Mr. Piollet, of Bradford, read an essay on "The Effect of Organization among Farmers."

On motion of Mr. Gundy, the chair named Messrs. Cooper, Patterson, and Barnes a Committee on Resolutions.

Adjourned to meet at 7.30 P. M.

Thursday Evening June 15, 1893.

Board called to order at 7.30 P. M., by Vice President Downing in the chair.

Mr. Cooper, on behalf of the Committee on Resolutions, reported the following, which were adopted by a rising vote.

Whereas, The stay of the members of the State Board of Agriculture, during the time of their summer meeting at Bethlehem has been pleasant and agreeable, we feel that we cannot adjourn without expressing our sincere thanks to all who have so kindly provided for our entertainment and pleasure.

Resolved, That we tender our thanks to the Committee of Arrange-

ments who so fully provided for our comfort and entertainment; to Jehn Fritz, Esq., managing engineer, and to Robert Sayre, superintendent of the Bethlehem Iron Works, for the special attention conferred upon members of the board during their visit to the large and prosperous works of the company which they represent; to Robert A. Lamberton, for the invitation to visit the Lehigh University; to the Fairview band for the excellent music furnished; to the correspondents of the press, for the full reports of the proceedings of the meeting published in their respective papers; to the citizens of Bethlehem generally, for the kind attention bestowed during our stay; to Baxter B. McClure, the resident member, for his indefatigable efforts in our behalf, and to Mr. Leibert for the use of the hall.

On motion adjourned to meet at Kittanning at the call of the Advisory Committee.

AUTUMN MEETING.

Held at Kittanning, Pa., October 11 and 12, 1893.

Wednesday Morning, October 11, 1893.

Board called to order at 9.30 A. M. by Governor R. E. Pattison in the chair.

Present during the sessions: Governor Pattison, and Messrs. Garretson, Lawson, Diehl, Stitzel, Reeder, Riddle, Thomas, Dr. Edge, Shanafelt, Davis, Herr, Eves, Gates, Hiester, Hopwood, Shook, Herrington, Musser, McCracken, Robison, Colvin, Cooper, McCreary, Barnes, Kirkendall, Fague, McKee, Shannon, Sexton, Clapp, McClure, Hoffa, Kistler, Searle, Gundy, Phipps, Lott, McDowell, Underwood, Sloan, Bunnell, Roland, and Secretary; and, on the part of the honorary officers, Prof. S. B. Heiges.

The Chair named Messrs. Barnes, Herr and McDowell a committee to receive the credentials of members and delegates, and to report upon them.

D. W. Lawson, Esq., resident member, delivered the opening address, and was followed by Hon. Calvin Reyburn in an address of welcome, which was replied to, on behalf of the Board, by Governor Pattison.

On motion of the Secretary, the Chair named Messrs. Herr, Hiester and Underwood a committee to revise the programme in order that the sessions of the Board might terminate at the close of the Thursday afternoon session.

J. E. Carahan, Esq., then read an essay upon "Potato Culture," the subject matter of which was discussed by Messrs. Stitzel, Kistler, Sloan, Eves, Cooper, Searle, Thomas, Oliver, McCreary, Garretson, Heiges, Carahan, Hopwood, Robison and Secretary.

On motion, adjourned until 1.30 P. M.

Wednesday Afternoon, October 11, 1893.

Board called to order at 1.30 P. M. by Hon. R. E. Pattison, in the chair.

Dr. Barnes, of Lehigh, on behalf of the Committee on Credentials, made the following report, which was, on motion, unanimously adopted:

"Whereas, An act of the Legislature of the session of 1893 made the Secretary of the Board of Agriculture ex-officio a member of the Board, a vacancy thereby occurred in the representation of Chester county. Dr. John P. Edge having presented credentials in proper form to fill the unexpired term, ending January 24, 1896, we therefore recommend the reception of the credentials.

Dr. Edge is the author of the act creating the Board, and was for many years one of its most valued members. The Committee therefore desire to congratulate the Board upon his return, assured that his services will be most valuable and the objects of the Board advanced.

The Pomona Grange of Armstrong county, send as delegates, F. F. Shoop, J. C. Walters and U. M. Crosby, whose credentials have been received and approved. We also recommend that they be received and that the usual privileges be extended to them as delegates.

(Signed)

J. P. BARNES,
J. A. HERR,
J. McDOWELL,
Committee.

Luther Gates, member from Crawford, read an essay on "Hay and Haying," which was discussed by Messrs. Kistler, Gates, Eves, Garretson, Sloan, Gundy, McCracken, McCreary, Hopwood, Oliver, Phipps, Hiester, Musser, Searle, Cooper, Heiges, Thomas, Sexton and Dr. Edge.

The committee to revise the programme reported, through Mr. Herr, in favor of an adjournment at the close of Thursday afternoon's session.

M. W. Oliver, of Conneautville, Pa., read an essay in answer to the question, "What is Practical Dairying?" The subject matter of the essay was discussed by Messrs. Eves, Phipps, Searle, Oliver, Herr, Armsby, Reeder and Secretary.

An essay by the Secretary on "The Width of Wagon Tires," was read by Mr. Gundy, and discussed by Messrs. Searle, McCracken, Barnes, Gundy, Thomas, Kistler, Blyholder, Shook, Cooper, Governor Pattison, Herr, McDowell, Armsby and Secretary.

On motion, adjourned until 8 P. M.

Wednesday Evening, October 11, 1893.

Board called to order at 8 P. M. by Hon. R. E. Pattison, in the chair.

Miss Florence Stitt, of Apollo, Pa., favored the Board with a recitation of "The Old Actor's Story."

Dr. H. P. Armsby, of the State College, delivered a lecture upon "Agricultural Experiment Stations at the Chicago Exposition."

On motion, adjourned to Thursday morning, October 12.

2-6-93

Thursday Morning, October 12, 1893.

Board called to order at 9 A. M. by Hon. R. E. Pattison in the chair.

S. S. Blyholder, Esq., of Leechburg, Pa., read an essay on "Sheep Husbandry," which called out discussion from Messrs. Sexton, McDowell, Underwood, Sloan, Blyholder, Hiester, Dr. Edge, Phipps and Stitzel.

Dr. H. P. Armsby answered questions relative to potato blight, and Prof. S. B. Heiges others relative to the use of lime.

Major B. F. Herrington read an essay in answer to the question, "Should the Science of Agriculture be Taught in Our Public Schools?" The essay brought out discussion by Messrs. Armsby, Herr, McDowell, Cooper, Lawson, Dr. Edge, McNeas, Gundy, Searle, Kistler, Sloan and Secretary.

On motion of the Secretary, the Chair named Messrs. Dr. Edge, Sexton and Shannon, a Committee on Resolutions.

Adjourned to meet at 1.30 P. M.

Thursday Afternoon, October 12, 1893.

Board called to order at 1.30 P. M. by Hon. R. E. Pattison in the chair.

J. B. Shannon, member from Mifflin, read an essay on "Profit of Farming," which was discussed by Messrs. Hiester, Shook, Shannon, Hopwood, Gundy, Sloan, Herr, Garretson, Sexton, Searle and others.

On behalf of the Committee on Resolutions, Dr. Edge reported as follows:

"This Board, having been so kindly entertained in the city of Kittanning, feel it their duty to formally recognize the same.

Therefore, be it resolved, That the thanks of the Board be extended to His Honor, Judge Reyburn, for his cordial address of welcome, to the county commissioners for the use of the court house, to the resident member, D. W. Lawson, for his untiring attention to our comfort, and to the citizens of Armstrong county for their attendance and for the active interest which they have shown in the proceedings of the Board.

(Signed)

J. P. EDGE,
J. SEXTON,
J. B. SHANNON,
Committee.

Calvin Cooper, member from Lancaster, read an essay on "The Application of Domestic Fertilizers," and was followed by a discussion of the paper by Messrs. Kistler, Heiges, Cooper and others.

J. J. Thomas, member from Cambria, called up the question of a place for holding the June meeting of the Board, but after a partial discussion of the question it was referred to the annual meeting for a decision.

On motion, adjourned to meet at Harrisburg the fourth Wednesday in January, 1894.

EXTRACTS FROM THE ANNUAL REPORT OF THE SECRETARY.

CROPS OF 1893.

Wheat.

The area devoted to this crop does not vary materially from year to year; the rotation adopted by our farmers of corn, oats and wheat with grass seed, does not permit of sudden changes in the area planted with any leading crop; the main integers which affect the slight variations in area are:

1. An open fall which offers inducements to our farmers to seed more than the usual amount of corn ground with wheat.
2. The failure of the grass seed in the previous year's wheat fields, which offers an inducement to re-seed the field with wheat in the hopes of getting a good catch of grass.
3. The present low price of wheat which has, in very many cases, induced wheat growers to reduce their acreage to its lowest possible limits, consistent with the production of a sufficient amount of straw for bedding.

Pennsylvania wheat growers realize that if grown for the grain alone, they are losing money on every bushel of wheat produced and sold for less than sixty-five cents, and that, but for the straw which they must have for bedding and the ensuing crop of grass, which they can obtain in no other way than through the agency of the wheat crop, they had better throw the crop out of the rotation.

The best data obtainable from our correspondents leads us to assume that the area devoted to wheat in our State varies from 1,275,000 to 1,350,000 acres, and that for the year 1893 the area may be estimated at 1,290,000 acres, this being very nearly our minimum acreage. The decrease in area noted for the present year is due: first, to unfavorable weather at seeding time last fall; second, to the low price of the product; third, to the rather unfavorable condition of the corn ground during the latter part of the fall of 1892, which prevented many from drilling wheat on the corn stubble.

The yield of this crop in our State varies from 11,750,000 bushels in unfavorable years to 22,500,000 in years favorable to its production.

The crop of 1893 may be placed at 20,100,000 bushels. Our annual consumption for food may be placed at 22,750,000 and for seed at 2,225,000 bushels or a total of 24,975,000, and it therefore follows that it requires an unusually favorable year for us to produce sufficient for our own needs, and that, in fact, we seldom, if ever, reach this point in the production of the crop.

Our returns indicate that there will be but little, if any, change in the acreage of the crop now in the ground; in a few sections of our State, the light condition of the corn crop, coupled with the early September frosts, have induced many to seed down a portion of the corn ground without plowing, the ground being thoroughly harrowed and the grain drilled and dressed with commercial fertilizers only.

Unless the condition of trade and business shall in some way affect prices, it is difficult to understand why the price of wheat should not advance before the crop now in the ground is harvested. The best authorities place the crop of the world at 1,493,000,000 bushels, as against a crop of 1,619,000,000 bushels for 1892, thus showing an apparent shortage of 126,000,000 bushels; in this estimate an allowance is made for an increase of crop in India of 61,000,000 over the crop of 1892, and a falling off in Great Britain and France of 37,000,000 bushels.

To illustrate the connection between the yield of this crop in the United States, and its price per bushel, we submit the following table which gives the amounts in round millions only.

YEARS.	IN ROUND MILLIONS BUSHELS.			Value per bu.	Yield per acre.
	Crop.	Exports.	Used.		
Average 1870-79	312	74	238	\$1.05	12
Average 1880-89	450	134	316	.83	12
Average 1890-92	512	174	338	.77	13
1883	421	111	310	.91	11
1884	513	133	380	.64	13
1885	357	95	262	.77	10
1886	457	154	303	.69	12
1887	456	120	336	.68	12
1888	415	89	326	.93	11
1889	490	109	381	.70	13
1890	399	106	293	.84	11
1891	612	225	387	.84	15
1892	616	192	424	.62	13
1893	500	155	345	.60	12

One of our best and most conservative authorities, in reviewing the situation and the prospects of prices for the coming year, uses the following language:

"But with the likelihood of being called upon to furnish England and Europe with from 150,000,000 to 200,000,000 bushels of wheat by July 1, 1894, even our estimation of present prospects makes it difficult to see how we can spare this quantity without curtailing our own consumption. Out of 58,000,000 bushels produced last year, the Pacific coast exported abroad 34,000,000, and had 2,000,000 more, in sight August 1, than a year ago. Out of a product in 1891 of 62,000,000 bushels, the same section exported 38,000,000 bushels of wheat (including flour as wheat) to supply famine-stricken Europe. With a crop of 70,000,000 bushels, therefore, the Pacific coast may be able to export 42,000,000, and by eating less than usual, may increase this to exports of 45,000,000 bushels.

The rest of the country furnished 158,000,000 bushels for export out of a total production of 558,000,000 bushels last year, leaving 400,000,000 for home consumption. But the present season the country outside of the Pacific States has apparently only 372,275,000 bushels in the new crop, and 37,379,000 more old, in sight August 1, than last

year. Allowing an excess of 16,000,000 bushels of old still in farmers' hands, makes the aggregate supply east of the Rockies only 425,000,000 bushels for consumption and export. Should threshing returns prove this estimate to be close to the facts, it may be difficult to spare 55,000,000 bushels for export.

This, with 45,000,000 from the Pacific coast, indicates a possible export surplus of 100,000,000 bushels, with every indication now that Europe will need much more than this.

The present low prices of wheat, in the face of the crop outlook, makes an exhibit of past crops specially interesting and timely. Hence the preceding table showing total crops, the amounts of each that were exported, the balance that was used for domestic consumption, the average value per bushel of wheat at the farm in December, and the average yield per acre."

Corn.

The area seeded to this crop is probably liable to a greater range than almost any other crop of our rotation; this is due to the fact that, with the expectation of seeding down to wheat after corn, the ground may be planted with corn a second year without materially interfering with the usual rotation, but the maximum and minimum acreage does not vary very materially from that already given for wheat.

The corn crop of 1893 is possibly the smallest that has been recorded since the formation of the Board of Agriculture; taking the average crop as the foundation for their estimates, our correspondents give the yield of the several counties of the State, expressed in per cent. of an average crop, as follows:

Adams,	57	Elk,	75	Montour,	66
Allegheny,	70	Erie,	75	Northampton,	70
Armstrong,	68	Fayette,	56	Northumberland,	66
Beaver,	75	Forest,	70	Perry,	62
Bedford,	69	Franklin,	59	Philadelphia,	70
Berks,	65	Fulton,	66	Pike,	75
Blair,	70	Greene,	59	Potter,	85
Bradford,	86	Huntingdon,	57	Schuylkill,	65
Bucks,	65	Indiana,	69	Snyder,	68
Butler,	60	Jefferson,	70	Somerset,	57
Cambria,	55	Juniata,	72	Sullivan,	65
Cameron,	70	Lackawanna,	85	Susquehanna,	90
Carbon,	72	Lancaster,	65	Tioga,	65
Centre,	60	Lawrence,	70	Union,	72
Chester,	67	Lebanon,	62	Venango,	80
Clarion,	65	Lehigh,	59	Warren,	90
Clearfield,	65	Lycoming,	56	Washington,	60
Clinton,	57	Luzerne,	80	Wayne,	75
Columbia,	75	McKean,	67	Westmoreland,	62
Crawford,	75	Mercer,	75	Wyoming,	85
Cumberland,	70	Mifflin,	66	York,	65
Dauphin,	59	Monroe,	75		
Delaware,	65	Montgomery,	70		

The failures of the crop was mainly due to long continued dry weather during the latter portion of May, and in June and July; some

correspondents report no rain to benefit this crop from May 25, to July 7.

In several of the best corn growing counties the shortage caused by dry weather was supplemented by storm, which prostrated the crop just at a critical period of its growth, and to a considerable extent prevented the proper formation of the grain and greatly added to the expenses of harvesting the crop. Losses from these two sources was also increased by the fact that fall rains caused the ears, many of which were on the ground, to mould.

Two general storms, which affected the greater portion of the State by blowing the corn down, very materially injured the fodder; this loss, in some counties, was estimated at fully fifty per cent. of the feeding value of the fodder.

We estimate the area planted with corn at 1,310,000 acres and the yield at more than 30,500,000 bushels. When we take into consideration the fact that our average corn crop is good for about 40,000,000 bushels, the extent of the shortage of our State is apparent.

Basing their estimates upon the condition of the crop August 1, the National Department of Agriculture thus estimates the national crop:

Comparing the August returns with last year, and estimating the yield per acre as correspondingly more or less, the government report indicates a total crop of some 1,750,000,000 bushels, or only 123,090,000 more than last year. Of this total, the seven corn surplus states have an indicated crop of 1,145,000,000 bushels, compared to 1,008,000,000 last year and 1,316,000,000 in the great 1891 crop—a decrease of 171,000,000 from that year, but an increase of 137,000,000 bushels over last year. But drouth has continued so generally in the corn belt since August 1, that, unless favorable weather at once occurs, the crop can hardly exceed 1,600,000,000 bushels, and may even drop to the size of the 1890 crop, when we harvested less corn than in any year for a decade, with but a single exception.

The "American Agriculturist," under date of September, compares the corn crops of the United States, for the past twenty years, as follows:

	STATED IN ROUND MILLIONS.				Bushel per Acre	Value per Bushel.
	Crop.	On Hand.	Acres.	Value.		
Average 1870-79	1.184		43	\$504	27	43
Average 1880-89	1.703		70	668	24	39
Average 1890-92	1.726	676	73	744	24	43
1883	1.551	512	68	658	23	42
1884	1.796	675	70	641	26	36
1885	1.936	773	73	396	27	33
1886	1.665	603	76	610	22	37
1887	1.456	508	72	646	20	44
1888	1.987	787	76	678	26	34
1889	2.113	970	78	598	27	28
1890	1.490	542	72	754	21	51
1891	2.060	860	76	836	27	41
1892	1.629	627	71	642	23	39
1893	1.600	600	73	720	22	46

In addition to the causes already noted, which operated to reduce the corn crop of 1893, we may add that of the failure of the seed to sprout; the previous winter was characterized by cold weather early in the season, before the corn in the crib had time to dry, and in all cases in which the seed was selected from the crib as the grain was hauled out during the winter, there was an unusual per centage of loss from a failure to grow. This loss, especially during the past season, could not possibly be made good by re-planting, and there were a large number of vacant hills in many of the best corn growing counties of our State.

Oats.

The acreage of this crop is always lower than that of either wheat or corn, from the fact that most farmers, and especially dairy farmers, regard it as an undesirable and unprofitable crop. That it is an undesirable crop is perhaps correct, but that it is unprofitable is not by any means so certain. That it is sometimes unprofitable may be due to the want of care in putting it in. Careless plowing, supplemented by the absence of manure or fertilizer of any kind, may destroy the profit of any crop, and especially that of a crop of oats. We need practical experiments to show the profit which may be derived from the application of artificial fertilizers to this crop, and we think such experiments will demonstrate the fact that it will respond to such applications more quickly than any other crop in the rotation.

We estimate the area in with this crop for the past year at 1,155,000 acres and the yield at 28,250,000 bushels by measure.

Our maximum crop of oats may be estimated at 42,000,000 bushels and our minimum crop at 26,000,000; this indicates a considerable shortage, which is mainly due to the same drouth which operated so disastrously upon the corn and potato crops of the present year.

Early in September the returns of the National Department of Agriculture warranted the following report in relation to the crop of oats for the United States:

"This years acreage of oats was never exceeded except in 1889, when over 750,000,000 bushels of oats were grown on 27,460,000 acres. The breadth of oats of the present season has been nearly a million acres larger than the average of the three years preceding. The indicated yield of 620,000,000 bushels is 41,000,000 less than last year, compared to an average of 614,000,000 bushels for 1890-1-2, 584,000,000 for the previous ten years, and 314,000,000 bushels as the annual average 1870-79.

"The condition of oats has fallen ten points since the July report, being 78.3 as compared with 88.8 last month, while in August, 1892, it stood at 86.2. It is the lowest condition reported in August for many years, and is due to a cold, wet spring succeeded by continuous dry hot weather during the latter part of June and the whole of July."

Potatoes.

Our returns from this crop indicates that in almost every county in our State, there were favored localities in which local showers at a critical time in the growth of the crop, has caused a production equal

to or above that of the average year, but the collated reports from the crop of late potatoes indicates a general shortage, which, if our own crop alone was concerned, would materially advance the price of the crop before planting time next year.

Early potatoes, planted before the general wet spell commenced, have yielded an excellent crop, and in very many cases our reports indicate that crops in southern and south-eastern Pennsylvania yielded well, but the general crop of late potatoes was probably the smallest that we have reported for many years. The average returns by counties, taking the average crops the basis and as 100, is as follows:

Adams,.....	55	Elk,.....	70	Montour,.....	67
Allegheny.....	65	Erie,.....	55	Northampton,....	65
Armstrong,.....	85	Fayette,.....	65	Northumberland,.	55
Beaver,.....	77	Forest,.....	67	Perry,.....	62
Bedford,.....	70	Franklin,.....	59	Philadelphia,.....	65
Berks,.....	75	Fulton,.....	55	Pike,.....	65
Blair,.....	60	Greene,.....	67	Potter,.....	85
Bradford,.....	65	Huntingdon,.....	55	Schuylkill,.....	70
Bucks,.....	65	Indiana,.....	54	Snyder,.....	70
Butler,.....	67	Jefferson,.....	65	Somerset,.....	59
Cambria,.....	60	Juniata,.....	70	Sullivan,.....	70
Cameron,.....	70	Lackawanna,....	90	Susquehanna,.....	80
Carbon,.....	60	Lancaster,.....	65	Tioga,.....	57
Centre,.....	55	Lawrence,.....	70	Union,.....	70
Chester,.....	75	Lebanon,.....	63	Venango,.....	75
Clarion,.....	70	Lehigh,.....	62	Warren,.....	70
Clearfield,.....	65	Luzerne,.....	85	Washington,.....	65
Clinton,.....	55	Lycoming,.....	65	Wayne,.....	70
Columbia,.....	79	McKean,.....	58	Westmoreland,....	57
Crawford,.....	65	Mercer,.....	59	Wyoming,.....	70
Cumberland,.....	60	Mifflin,.....	63	York,.....	70
Dauphin,.....	65	Monroe,.....	70		
Delaware,.....	60	Montgomery,....	70		

The main cause of the failure of the crop was a long, continued drouth, which, with the general planting, overtook the vines just at that critical period when the potatoes are either forming or filling out. In many patches planted rather early, the effect of the drouth was to prevent the increase in the size of the tubers, as was proven by the fact that fully as many were started as in years of our greatest yield, and that, had the weather been fair, we would have harvested a large crop.

In other cases but few tubers were set, showing that the dry weather affected the crop at an earlier period in their growth, and that even the best of weather would not, in such cases, have made a full crop.

A considerable percentage of loss was due to the failure of the cutting to grow; this was specially the case upon low or wet ground and with patches planted just previous to the commencement of the wet spell.

In the early crop a portion of loss was due to the fact that the long continued wet weather, just at the time when the cultivators should

have been going, prevented proper working of the soil, and as a natural result there was a crop of weeds, which absorbed the small amount of moisture in the soil.

Owing to the low price of seed potatoes and the general theory that prices would advance, more than the usual area was planted with this crop, but any increase in the crop of 1893, from this cause, was much more than discounted by the decreased yield of the crop.

Several of our correspondents, notably in Lancaster county, reported losses from the potato borer, which, by boring the stalk, injured the plants and decreased the yield. In Columbia, Bradford and other counties considerable loss was caused by the Blister beetle attacking the vines, and it may be assumed that probably owing to long continued dry weather, the damage to this crop by insects was greater than during any preceeding year of the past two decades.

The more general introduction of labor-saving machinery for planting and digging this crop, will, as it has done with all other farm crops inevitably increase the area planted and proportionately, taking the average season, yield and price into consideration, decrease the price in the market, and proportionately decrease the profits of the grower who does not make use of labor-saving machinery

Hay.

This crop, like that of potatoes, was very irregular in its yields, as our reports indicate that there were many sections, limited in extent, in which an excellent crop of hay was harvested, but a general summary of reports from our correspondents indicates that the crop of the State was below the average.

In some localities this was partially due to the failure of the grass sown in last year's wheat stubbles, in others it was in part due to heavy snow falls remaining long upon the ground, and in some sections so heavy, followed by freezing rains, that it smothered the clover.

Some localities report a very good yield of clover hay, but a general failure of timothy, and assign as a reason that rains at the proper time saved the clover from the worst effects of the drought, but were too soon to have a similar effect upon the timothy hay.

Several of the reports of our correspondents note the fact that where the clover seed sown in the spring of 1892, and also that sown last spring, was sown at two periods some distance apart, the set was much better, the theory being that what was lost by one sowing was gained by the other. Now that this work can be satisfactorily accomplished by machinery, there is no difficulty in making at least two sowings and thus avoiding the general loss which so often follows when the dependence is in one sowing only.

During the past year considerable amounts of hay have been exported to France to make up, at least in part, the deficiency in the European crop; several car loads were also shipped from central Pennsylvania direct to southern points.

Local or Farmers' Institutes.

During the year ending June 1, 1893, the Board held eighty-one local farmers' institutes in various counties of the State; in addition

to these, three institutes were held in connection with meetings of the Board in the counties of Franklin, Dauphin and Indiana, thus making a total of eighty-four institutes during the appropriation year. The institute of Cambria county was, with its appropriation, carried over until after June 1, thus making eighty-four institutes provided for.

In making a distribution of the annual appropriation, the Advisory Committee awarded one hundred and fifty dollars to each of the following counties upon condition that not less than two institutes should be held in each, viz: Chester, Bucks, Columbia, Clinton, Lancaster, Susquehanna, Northumberland and York. The other counties of the State were awarded the sum of one hundred dollars each.

The counties of Allegheny, Beaver, Cameron, Carbon, Delaware, Elk, McKean, Monroe, Philadelphia, Pike, Potter, Schuylkill, Snyder, and Tioga made no claim upon the Board for the amount of their appropriations.

The counties of Clinton, Lancaster, Mercer, Northumberland, Susquehanna and York held three institutes each. The counties of Adams, Armstrong, Bedford, Bucks, Centre, Chester, Clearfield, Columbia, Indiana, Jefferson, Lackawanna, Lawrence, Luzerne, Montour, Northampton, Perry, Union and Wayne, held two each, and the other counties which made a claim for a portion of the funds, one institute each.

The number of institutes held, and the average attendance at the sessions was largely in increase of that of the preceding year, and this increased interest is further shown by the increase in number of institutes asked for during the present year. Last year applications for one hundred and twenty-three institutes were filed in the office of the Board; this year the number of similar applications amounts to one hundred and fifty-three.

Last year considerable dissatisfaction was expressed with the mode of distributing the funds, and at the opening of our present year the Advisory Committee, after carefully considering each proposed plan, decided to award the amount of seventy-five dollars (as a minimum) to each county, with a further award of two cents per farm as shown by the census of 1890.

Under this mode of distribution the amount awarded to each county is as follows:

COUNTIES.	Number of Farms, 1890.	Increased Allot- ment.	Total.	COUNTIES.	Number of Farms, 1890.	Increased Allot- ment.	Total.
Adams,	3336	865.	\$140.	Lackawanna,	1579	\$80.	\$105.
Allegheny,	5343	105.	180.	Lancaster,	9440	190.	265.
Armstrong,	4127	80.	155.	Lawrence,	2575	50.	125.
Beaver,	2672	55.	130.	Lebanon,	2400	50.	125.
Bedford,	3220	65.	140.	Lehigh,	3378	70.	145.
Berks,	6862	140.	215.	Luzerne,	2850	55.	130.
Blair,	1490	30.	105.	Lycoming,	3352	65.	140.
Bradford,	6415	130.	205.	McKean,	1460	30.	105.
Bucks,	6364	125.	200.	Mercer,	5021	100.	175.
Butler,	5364	105.	180.	Mifflin,	1143	25.	100.
Cambria,	2241	45.	120.	Monroe,	1767	35.	110.
Cameron,	339	5.	80.	Montgomery,	5361	105.	180.
Carbon,	982	20.	95.	Montour,	914	20.	95.
Centre,	2180	45.	120.	Northampton,	3396	70.	145.
Chester,	6119	130.	195.	Northumberland,	2361	45.	120.
Clarion,	3115	60.	135.	Perry,	2314	25.	100.
Clearfield,	2812	55.	130.	Philadelphia,	801	15.	90.
Clinton,	1162	25.	100.	Pike,	960	20.	95.
Columbia,	2415	50.	125.	Potter,	2128	45.	120.
Crawford,	7786	155.	230.	Schuylkill,	2680	55.	130.
Cumberland,	2944	60.	135.	Snyder,	1667	35.	110.
Dauphin,	2677	55.	130.	Somerset,	3471	70.	145.
Delaware,	1469	30.	105.	Sullivan,	958	20.	95.
Elk,	759	15.	90.	Susquehanna,	4716	95.	170.
Erie,	5483	110.	185.	Tioga,	4552	90.	165.
Fayette,	3320	65.	140.	Union,	1224	25.	100.
Forest,	491	10.	85.	Venango,	3054	60.	135.
Franklin,	3295	65.	140.	Warren,	2881	60.	135.
Fulton,	1305	25.	100.	Washington,	4514	90.	165.
Greene,	2924	60.	135.	Wayne,	3659	75.	150.
Huntingdon,	2391	50.	125.	Westmoreland,	5339	105.	180.
Indiana,	4644	95.	170.	Wyoming,	1732	35.	110.
Jefferson,	2531	50.	125.	York,	7730	155.	230.
Juniata,	1609	30.	105.				

In accordance with the rules of the Committee, the list of applications was closed September 20, when it was found that the counties of Cameron, Elk, Forest, McKean, Pike and Potter had made no claim for the share of the institute fund awarded to them by the Committee. An application was afterwards received from Potter county, but too late to secure the award.

One of the propositions made to the Committee was based upon an award of a certain rate per farm, without any minimum, but this was not deemed advisable as in some or the smaller counties of the State, the amount under this plan would have been insufficient to hold a good institute, and that it would be best to make a minimum award of a sum sufficient to ensure a good institute, and to increase this by an allotment based upon the number of farms, thus giving the larger agricultural counties the preponderance to which they were entitled.

The experience gained by the institute season of 1892-93 indicates that a change might with profit be made in our institute system, by which the Advisory Committee may be empowered to employ lecturers and leading agriculturists to attend a course of institutes properly ranged in a consecutive series, in such a manner that speakers may be taken from one to the other without any extra amount of travel or any great loss of time. Such a change will make it necessary that the Committee, either by special rule or by an agreement with institute managers, should control the dates at which institutes shall be held, for, without some such provision, much loss of time and funds would ensue.

This plan has voluntarily been adopted by a number of institute managers in different portions of the State during the present year, and the experience thus gained, and the benefits received, make it probable that it will next year be adopted by institute managers generally throughout the State.

During the year commencing June 1, 1893, the counties of Carbon, Delaware, Monroe, Philadelphia and Cambria, which have not heretofore claimed their portion of the institute fund, have this year made applications for institutes, which have been granted. The counties of Cambria and Monroe have, by the election of members of the Board, obtained the right to their allotments. The counties of Allegheny and Tioga, which held no institutes last year, have made application this year and have been awarded their quota from the appropriation.

Considered as a whole, the institute season of 1892-93 has been a great improvement upon any preceding years, and this improvement has been shown in the following directions:

First. By the increased attendance at the institutes.

Second. By the increase in the number of institutes asked for.

Third. By the number of counties which are now claiming the recognition of the Board which have not made previous applications of this character.

Texan Fever.

The past year has been characterized by two outbreaks of Texan fever of more than usual virulence, and resulting in greater losses to individual stock owners than any for several years past, and it is worthy of note that both are probably entirely due to a violation of the rules and regulations imposed by the National Bureau of Animal Industry. During the past few years a strict adherence to these rules had prevented serious outbreaks, and the experience thus gained had enabled the department to formulate rules which, if strictly adhered to, would no doubt have prevented the outbreaks of the past year.

An outbreak at Pittston, Luzerne county, has the following history:

Chapman & Co., of Pittston, purchased several car loads of cattle of G. F. Herriott & Co., of Illinois; arrangements were made for their delivery in car load lots of 25 for each week, commencing with May 12. Arrangements had also been made to have the cattle pastured at the farm of George Wagner, near Pittston, until they were killed, the privilege being granted to kill a few at a time, as wanted. The cars were distinctly marked "Cattle from infected district—for slaughter only," but they were allowed to come in contact with other cattle after landing at Pittston and before they were killed.

None of the western animals showed any signs of disease, but the butchers who killed them state that they were covered with "Texan cattle ticks," and the evidence indicates that one or more car loads of the cattle carried the infection of Texan fever with them.

About fifty-six days after they had been exposed to the first shipment of western or southern cattle, Mr. Wagner's animals commenced to show signs of Texan fever, and the outbreak did not subside until all of Mr. Wagner's cattle were dead. Other (native) animals in the neighborhood which had come in contact with the shipment of cattle were covered with the same kind of "ticks," and, although several were sick, none were lost. The losses by the outbreak are estimated at \$300.00.

As soon as it was demonstrated that an unusual disease had broken out, Dr. Bridge was sent to Pittston and at once diagnosed it as Texan fever, and recommended the treatment usually accorded to this disease; prompt application of these remedies undoubtedly saved the lives of a number of animals and very much mitigated the losses by the outbreak.

While the outbreak at Pittston was in progress, one of a similar nature was reported near Doe Run, Chester county, which has the following history:

Two carloads of cattle were shipped from Branchville, Southampton county, Virginia, to Newark, Delaware; they were shipped June 3, and arrived at Newark on the fifth, and were turned out to pasture in a meadow nearby, where they remained until the eleventh, and were then driven to Kimbleville, Chester county, Pa., where they were sold to farmers for "feeders;" four of them were purchased by Evan Baker and driven to his farm near Doe Run and there turned into pasture with the miscellaneous stock of the farm, including ten head of cattle which had been on the farm nearly a year and were fat, and a number of home raised animals. As the purchased animals were supposed to have come from Northern Maryland, nothing wrong was suspected until, on August 12, Mr. Baker found one of his fat steers dead and three others seriously sick. Others continuing to show symptoms of the disease, and several having died, neighboring stockowners became alarmed and the assistance of the State Board of Agriculture was called in and Dr. Bridge at once sent to make an investigation and report. From external appearances of the sick animals, and from descriptions received from those who had made several post-mortems, Dr. Bridge had no hesitation in pronouncing the disease Texan fever, and recommended the usual remedies in such cases.

In this case, as in the preceding one, the purchased animals were found to have a number of the "Texan ticks" on their bodies, and the native animals were found to have them also, but this was not observed until the theory of Texan fever was suggested, the disease having been treated as anthrax.

During the outbreak Mr. Baker lost thirteen animals, valued at \$785.00, and it is estimated that those which were sick but did not die were damaged to the extent of not less than \$150.00 more, making Mr. Baker's loss not less than \$935.00.

It is evident that in this case, as in the outbreak at Pittston, the loss was entirely due to a violation of the rules of the Department of Agriculture and of the National Bureau of Animal Disease, as the animals were shipped north for "slaughter only," and should not have been permitted to come in contact with other animals.

Thus far the officers of the Board have found but little benefit to arise from the use of medicines, the main benefit observed being from the use of stimulants which enable the animal to withstand the attacks of the disease until it has run its course.

In neither case did the disease spread to animals which had not come in contact with the southern or western cattle, and in neither case were these cattle affected with the disease. All the animals in Mr. Baker's herd were more or less affected, but the disease did not show itself in any of the neighboring stock. In both cases it is shown that the "ticks" were present upon animals which showed no symptoms of the disease, and that other animals purchased from the Kimbleville lot had large numbers of "ticks," but did not show any bad effects therefrom and did not convey the disease to animals with which they came in contact.

Both of these outbreaks are unusually interesting from the fact that in both the presence of the "tick" was noted; in fact, in both outbreaks they were found in large numbers on all the animals exposed to the infection, but they were quite as abundant upon animals which showed no sign of the disease as upon those which died from its effects. This naturally brings up the question of the connection between the conveyance of the disease and the presence of the "ticks," and in this connection the following quotation from the report of the National Department of Agriculture, (issued during the present year):

"The hypothesis which seemed most plausible after the experiments of 1889 was that the tick, while withdrawing blood from the southern cattle, drew out in it the Texas fever parasite, which, entering into some more resistant state, perhaps some spore state, was disseminated over the pastures when the body of the mother tick became disintegrated. These spores were then supposed to enter the alimentary tract with the food and infect the body from this direction. The later experiments, however, completely demolished this conception. Neither the feeding of adult ticks and tick eggs nor the feeding of grass from infected pastures gave any positive results. On the other hand, the unmistakable outcome of the experiments was that the young tick introduced the infection into the body. This fact implies two possibilities. Either the tick is a necessary or a merely accidental bearer of the micro-parasite. If a necessary bearer of the infection, we must as-

sume that the latter undergoes certain migrations and perhaps certain changes of state in the body of the adult tick and finally becomes lodged in the ovum. Subsequently it may become localized in certain glands of the young tick and discharge thence into the blood of cattle. This hypothesis assumes a complex symbiosis between the tick and the parasite on the one hand and the cattle and the tick on the other. According to another simpler hypothesis the tick would be merely an accidental bearer of the infection. The parasite entering the body of the tick with blood of the cattle may be already in the spore state or about to enter upon such state. The young ticks, as they are hatched near the dead body of the female, may become infected from this. This infection, clinging to their mouth parts, is introduced into the blood of the cattle to which they subsequently attach themselves. Further investigations are necessary before the probable truth of one or the other of these hypotheses can be predicated with any degree of certainty.

"It should be stated that the contents of the bodies of ticks in various stages of growth have been examined microscopically with considerable care. The abundant particles resulting from the breaking up of the ingested blood corpuscles obscured the search so that nothing definite thus far has resulted from it. The very minute size of the micro-organism renders its identification well-nigh impossible, and any attempts will be fraught with great difficulties."

The deductions which we may draw from these two outbreaks would lead us to infer that if the "ticks" are a vehicle by which the disease is conveyed from the southern to the northern animal, they do not in all cases so act, for, in both outbreaks, northern animals were found carrying large numbers of "ticks" and yet exhibited no symptoms of the disease. In the case of the outbreak at Mr. Baker's, several other persons bought animals from the same carload which, though they had ticks in large numbers, did not convey the disease to other animals with which they came in contact.

Glanders.

The application of the act of May 9, 1889, to this disease, has called the attention of the public not only to its existence to an unsuspected degree, but to the importance of being able to diagnose it and distinguish it from the many nasal disorders to which the horse is liable. In many cases which have been brought to the notice of the officers of the Board, catarrh, nasal gleet and similar non-contagious nasal diseases have been mistaken for glanders, and in one case a valuable animal was killed under the supposition that it was suffering with glanders and therefore a menace to neighboring stock.

Several prominent writers upon the subject divide this disease into three classes, viz: pulmonary, farcy and nasal glanders. This distinction is more one of the parts mainly affected, than of any real difference in the nature and character of the disease. If the inner surfaces of the nostrils are the parts most violently affected, the case becomes one of nasal glanders; if the bronchial tubes have become affected, it assumes the pulmonary form. Hence, we think that such a distinction is more fancied than real, and, if indulged in, has a tendency to confuse the stock owner and in the end injure the veterinarian who adopts the distinction.

All authorities agree that there are numerous diseases of the nasal organs which cause a discharge closely resembling that of glanders, and that, under a variety of surrounding circumstances, the discharge and symptoms of glanders will vary materially. It therefore follows that unless he has the previous history of the case, the State Veterinary Surgeon, when called upon to inspect a supposed case, is unable to at once diagnose the disease, he will find nothing in the character of the discharge which will, at a glance, enable him to distinguish between glanders and the discharge caused by nasal catarrh; he will find no ulceration which might not have come from some local disease; in fact, coming to the case an entire stranger, he is forced to depend very much upon the sagacity and judgment of the local veterinarian who probably positively reported the case as one of glanders.

In cases of doubt the animal is placed in quarantine and a guinea pig inoculated with the discharges from the nostrils; from some cause not yet explained, the guinea pig is probably the most susceptible of all other animals to the virus or germ of glanders and is therefore an excellent subject for such experiments.

Williams gives the following as the symptoms of this disease: "The disease, preceded by increased temperature of the body, appears suddenly, ushered in by rigors, sometimes of a most persistent character. In one case which fell under my notice the rigors continued without intermission for three days and nights, at the end of which time a sanguineous discharge issued from both nostrils, the Schneiderian membrane became violently inflamed and deeply ulcerated. More commonly, however, the rigors are not so persistent, but they are always more or less observable; the temperature is sometimes as high as 106 or even 109 degrees, F., the breathing is accelerated, the pulse feeble, rapid and even dicrotonous, the heart's action palpitating and accompanied by metallic tinkling, the appetite fails, the pituitary membrane, at first of a dark copper color, with patches of ecchymosis of a dark red hue, becomes purple, and the patches are rapidly converted into pit-like, ragged-edged ulcers, from which issues copious sanious discharge. The submaxillary lymphatic glands enlarge. Other lymphatic glands inflame, enlarge, suppurate, burst and expose raw, unhealthy-looking sores, from which issues a more or less ichorous and irritating, purulent material. The eyes are weak and discharge issues from them; the nostrils are often swollen. The breathing is hurried, irregular and impeded by the swelling of the nostrils and by glutinous discharges drying around them; abscesses speedily form along the course of the lymphatics of the face. The urine is pale, watery and increased in quantity."

Dr. Law, (Farmers' Veterinary Adviser, page 43,) gives the following as characteristic symptoms; "Languor, dry, staring coat, red, weeping eyes, impaired appetite, accelerated pulse and breathing, yellowish-red or purple streaks or patches in the nose, watery discharge, with sometimes painful dropsical swellings of the limbs or joints. Soon the nasal flow becomes yellow and sticky, causing the hairs and skin of the nostrils to adhere together, and upon the mucous membrane appear yellow elevations with red spots, passing on into erosions and deep ulcers of irregular form and varied color and with

little or no tendency to heal. The lymphatic glands inside the lower jaw where the pulse is felt, become enlarged, hard and nodular, like a mass of peas or beans, and are occasionally firmly adherent to the skin, the tongue or jaw bone. The lymphatics on the face often rise as firm as cords. An occasional cough is heard and auscultation detects crepitation and wheezing in the chest. The ulcers increase in number and depth, often invading the gristle and even the bone, the glands also enlarge but remain hard and nodular, the discharge becomes bloody, foetid and so abundant and tenacious as to threaten or accomplish suffocation, and the animal perishes in the greatest distress."

In cases in which the disease takes that form known as farcy, the lymphatics are enlarged, with firm-like cords, and along this firm surface "farcy buds" develop, burst, discharge and take on that peculiar form so characteristic of the disease. These buds very often follow the lines of the lymphatica and larger veins on the inside of the legs, and are followed by an enlargement and swelling of the affected limb.

The most difficult case with which the State officers, and, in fact, surgeons generally, have to deal with are those in which the disease, having passed its acute stage without causing the death of the animal, appears to get better and appetite returns; it then becomes difficult to convince the owner that the animal is dangerous to horses with which it may come in contact, or which may come in contact with even the slight nasal discharge. The owner insists that the animal is nearly well and that all danger has passed. All the past experience of the State officers in dealing with this disease proves that such animals are by far the most dangerous to the community, for an animal with a copious discharge from its nostrils is always an object of suspicion among horsemen, while one with a slight, gummy discharge is considered as simply a case of cold or distemper and therefore not to be feared.

A case of well developed and well established glanders should not receive any treatment at all; the animal should at once be killed; cases of cure are so infrequent, and the living animal is so dangerous to the community that remedial measures should not be resorted to, and in cases which come under the care of the State officers, the animal is promptly killed and all danger thus removed.

Our experience leads us to believe that the danger of the communicability of glanders had been somewhat magnified, and that to produce actual infection the contact with the diseased matter must take place soon after it is thrown off by the animal, and before it has had time to become dried; it is also evident from practical experiments that the germs of the disease may be taken into the system or lodged upon the body without affecting the animal upon which they thus find lodgement. That much depends upon the condition of the system and the presence of abrasions in the skin of the body or nostrils.

We are also satisfied from practical and careful observation, that the virulence of the disease is more or less modified by the condition in which the animal is kept; the character of the food and care which is given it; the condition and ventilation of the stables in which it is kept; in fact, upon a variety of surrounding circumstances too

numerous to mention. A glandered animal well fed, well housed, moderately worked, may, without exhibiting any very evident symptoms, have the disease for a considerable time before its existence is suspected, whereas, with an animal with all of these conditions reversed it would die in a very short time with the most unmistakable symptoms of the disease.

Practical observations also show that in high and dry altitudes a glandered horse may remain for a long time without showing the infection from contact with the diseased matter thrown off from him; the surroundings being all favorable to throwing off the disease, the surrounding animals are not so liable to the infection and even though they may come in contact with the germs of the disease, have the power of throwing them off without their having found a congenial seed-bed in their systems.

Tuberculosis.

During the past two years there has been an unusual interest manifested, especially in the dairy districts of the State, in reference to the continued existence of tuberculosis among domestic animals and especially from milk cows, in the south-eastern part of our State. For the past fourteen years the officers of the Board, acting under the general act relating to contagious diseases, have condemned and advised the killing of numerous animals known to be affected with this disease, and in two instances the whole herd was slaughtered by the advice of the veterinary surgeon and Secretary of the Board.

On account of the limited amount appropriated for the purpose of investigation and surgeons' fees, etc., it was thought best not to take decided and general action against the disease, but during the session of the Legislature of 1893, the following act was, at a late period in the session, introduced by the chairman of our Committee on Legislation.

AN ACT

To prevent the spread of Tuberculosis among domestic animals.

Section 1. *Be it enacted, etc.*, That when it shall be brought to the notice of the Governor and Secretary of the State Board of Agriculture that a contagious disease known as tuberculosis exists among domestic animals in this State, they may take proper measures to prevent its further spread.

Section 2. That for this purpose they shall have power to place infected animals, herds and premises in quarantine, to prescribe the rules regulating such quarantine, to employ such assistance as may be necessary to properly carry out the provisions of this act, and to fix their compensation, and to regulate the movement of animals likely to convey the contagion from the infected premises.

Section 3. That any person or persons willfully violating any of the provisions of such quarantine or willfully interfering with officers appointed under this act, shall be deemed guilty of misdemeanor and shall upon conviction, be punished by a fine not exceeding one hundred dollars or by imprisonment not exceeding one month, or both at the discretion of the jurisdiction under which conviction is secured.

Section 4. That when it shall be deemed advisable to condemn and

kill any infected animals and an agreement cannot be made with the owners thereof as to their value, three appraisers shall be appointed, who shall, under oath or affirmation, appraise the animal or animals, taking into consideration their actual condition at the time of appraisal, and the owner shall be paid one-half of the said appraisal: Provided, That no such appraisal shall exceed forty dollars for any one animal.

Section 5. That all necessary expenses under the provisions of this act shall, after approval in writing by the Governor and Secretary of the State Board of Agriculture, be paid by the State Treasurer upon the warrant of the Auditor General in the manner now provided by law.

Section 6. That the Secretary of the State Board of Agriculture may, upon application from the owner or owners of any herd, detail a proper veterinary surgeon to examine said herd, and on the report of such surgeon, may issue a certificate showing the condition of the herd at the time of examination: Provided, That the expense of such examination shall be paid by the owner or owners of the animals examined.

Section 7. That all acts or parts of acts inconsistent herewith be and the same are hereby repealed.

This act was read in place in the Senate by Hon. N. B. Critchfield, member of the Board from Somerset and Chairman of the Committee of Legislation, was referred to the Senate Committee on Agriculture, and unanimously reported to the Senate with a favorable recommendation, passed three readings in the Senate without opposition of any kind, was messaged over to the House of Representatives, referred to its Committee on Health and Sanitation, and was unanimously reported to the House with a favorable recommendation and passed, without opposition, on first and second reading; there being no opposition of any kind, it is but fair to suppose that it would have become a law, but the adjournment of the House of Representatives left it among the uncompleted business on the calendar.

One of the main difficulties in drawing up such an act is to be found in the section allowing compensation to the owners of animals condemned and killed by the orders of the State officers, but there seemed to be a general agreement upon the part of all interested that there should be some compensation for animals killed.

The act of May 1, 1879, for the eradication of contagious pleuro-pneumonia, so successfully put into action by the Board of Agriculture and so successfully and economically completed by them, gave the Governor power to make all rules relating to compensation for animals killed and, in fact, for all other purposes in carrying out the provisions of the act. In his commission to the Secretary of the State Board of Agriculture (who acted as the special agent of the Governor), Governor Hoyt gave the following instructions:

"You are further directed, whenever the slaughter of diseased animals is found necessary, to certify the value of the animal or animals so slaughtered, at the time of slaughter, taking into account their condition and circumstances, and to deliver to their owner or owners, when requested, a duplicate of such certificate. Whenever any owner of such cattle, or his agent or servant, has willfully or know-

ingly withheld or allowed to be withheld, notice of the existence of the said disease upon his premises or among his cattle, you will not make such certificate."

The act of May 9th, 1889, (to prevent the spread of contagious diseases among live stock) provides (section 3rd) as follows:

"That when it shall be necessary or expedient to kill any animal or animals to prevent the spread of contagious disease, it, or they shall first be appraised by sworn appraisers who shall have due consideration for the actual condition of the animal or animals, at the time of appraisement, and the owner or owners shall be entitled to receive from the Secretary of the State Board of Agriculture a certificate of value, which may be paid from current appropriations or by a subsequent appropriation by the Legislature: Provided, That the amount of such certificates, issued in any one year, shall not exceed the sum of twenty-five hundred dollars.

In the practical working of the Act of May 1st, 1879, and in the working of the act of May 9th, 1889, it was found that if the cash was paid at the time that the animals were killed, a much less amount would be accepted by the owner and hence the Secretary of the State Board of Agriculture, by advice of the Auditor General and Attorney General, paid the full amount of the appraisement before the animals were killed. The saving to the State by this plan was great and in all cases the owners were better satisfied.

By an act to provide for the destruction of all animals affected with tuberculosis and glanders, the State of New York makes the following provision for the compensation of the owners of stock destroyed:

"The actual value at the time of destruction of any animal killed in pursuance of this article, not exceeding in the case of a horse affected with glanders the sum of fifty dollars, shall be paid the owner thereof by the state, and the court of claims shall have exclusive jurisdiction to hear, audit and determine any such claims. Where the said claim relates to cattle killed for tuberculosis, and in the case of a horse killed for glanders, the claim shall be audited by the local board of health and paid on their certificate and the warrant of the comptroller; but no such compensation shall be allowed any person who shall have willfully concealed the existence of such disease, or who directly or indirectly, by act of willful neglect, shall have contributed to the spread of such disease, or who shall not have filed his claim within two years after such claim shall have accrued."

After fourteen years of practical test and after the experience gained by its incorporation into the Act of May 9th, 1889, it is believed that the plan of compensation then adopted can hardly be improved upon, and that section 4th of the proposed act properly protects the interests of both State and owner, and that its provisions, like those of the special agent of the Governor, under the act of May 1, 1879, will be willingly accepted by the unfortunate owner of diseased animals which it becomes necessary to destroy in order to prevent the further spread of the tuberculosis.

Line or Division Fences.

Questions from the question box of our farmers' institutes and the general correspondence of the Board both indicate that there is an un-

certainly in the minds of many as to the effect of the repeal of the Acts of 1700 and 1748 upon the laws regulating line or division fences. Some claim that by the repeal of the Acts of 1700 and 1748 we lost all definition of a legal fence, and that this being the case, the Act of March 11, 1842, (governing division fences) fell also. We have at farmers' institutes and other places, as well as in our report of last year, claimed that the repeal of the Acts of 1700 and 1748 in no way affected the Act of 1842, which carried with it its own definition of a division fence.

The decision of the Supreme Court in the case of *Odenwelder vs. Frankenfield* (153rd Penna. Reports--page 526) appeared to so thoroughly settle the case that little doubt should have remained as to the status of the Act of 1842. It has, however, been claimed that this decision was more or less affected by the fact that the fence in question was a lane fence as well as a division fence between two land owners.

More recently, however, the point has been settled by an opinion delivered by Judge Hemphill, of the Chester county court, in the case of *Roberts vs. Sarchet*, in which the court distinctly ruled that the Act of March 11, 1842, was still in force and governed the erection and maintenance of division or line fences.

In order that the case, which is a direct and distinct one and based solely upon the Act of 1842, may be thoroughly understood, we quote the following from Judge Hemphill's decision:

"The plaintiff and defendant are the owners of adjoining farms in West Whiteland township. The division or line fence between the farms erected several years ago, consists of two hundred and forty-five panels, one hundred and twenty-six panels of which are maintained by the plaintiff and the remaining one hundred and nineteen by the defendant, and the land on either side is improved land.

Last spring, the plaintiff's portion was in good condition, but the defendant's was bad; fifty-eight panels required resetting with new posts and sixty-one panels needed repairing.

Mr. Walter S. Wyatt, tenant on the farm of the plaintiff and his agent, requested the defendant to repair his portion of the fence, which he declined to do. Mr. Wyatt then called upon two of the auditors of said township, he being the third, as fence viewers, to view said fence.

On April 15, 1893, J. Leman Maule and Thomas S. Downing, Jr., the other two auditors, met upon the premises, and after being duly sworn as fence viewers, viewed said line fence and certified "that Mr. Roberts maintains 126 panels and Mr. Sarchet 119 panels. That Mr. Roberts' fence is a sufficient and lawful fence; that of Mr. Sarchet's, 58 panels, were not sufficient and lawful, but needed resetting with new posts, and that 61 panels required repairing; and we hereby decide and direct that Mr. Joseph Sarchet proceed within ten days to reset and repair the said fence at his expense, and complete the same in a reasonable time."

Mr. Sarchet had five days' notice of the meeting of the viewers, but did not attend on the day of the view; Mr. Maule, one of the viewers, served a copy of the above (in part quoted) certificate upon the defendant.

Twelve or fifteen days were allowed to elapse, after service of said

certificate, when Mr. Sarchet, having failed or neglected to repair his portion of the fence, the work was done by Mr. Wyatt at an expense of \$26.68 and for which amount he presented Mr. Sarchet a bill that remains unpaid.

In May following the above recited agreement for an amicable action was entered into, and on June 8, 1893, a supplemental certificate was made out by said viewers, in which, after reciting the substance of the first certificate, they add, "and that Mr. Joseph Sarchet should pay Mr. Roberts twenty-six dollars and sixty-eight cents, that sum having been expended by Mr. Roberts in the repairs and reconstruction of Mr. Sarchet's fence."

It was admitted at bar that Mr. Sarchet received a copy of this supplemental certificate or report after the work was done.

The defendant resists payment of the \$26.68 expended by the plaintiff upon two grounds:

First. Because the Act of March 11, 1842, under which these proceedings were instituted, has been repealed by the Act of April 4, 1889, or more accurately speaking, that the latter act by repealing the first section of the Act of 1700, upon which the Act of 1842 rested and which alone gave it vitality, has nullified or rendered it inoperative.

Second. Because the viewers neglected prior to the repairing of the fence, to set forth in their certificate the sum which, in their judgment, Mr. Sarchet ought to pay for the building or repairing of his portion of the same.

The Act of 1700 consists of two sections.

The first section which was repealed by the Act of April 4, 1889, provided "that all corn fields and grounds kept for inclosures shall be well fenced with fence, at least five feet high, of sufficient rail or logs and close at the bottom."

The second section provides: "That where any neighbors shall improve lands adjacent to each other or where any person shall enclose any land adjoining to another's land already fenced in, so that any part of the first person's fence becomes the partition between them, in both these cases the charge of such division fence (so far as enclosed on both sides), shall be equally borne and maintained by both parties."

An examination of the sections as above cited, satisfies us that the second section is not dependent upon the first. The first relates to the fencing of all corn fields and grounds kept for inclosures, and makes such fencing obligatory.

The second relates to division fences and only becomes operative when "neighbors improve lands adjacent to each other or where any person shall enclose any land adjoining to another's land already fenced in."

So much of the second section as we have quoted was re-enacted almost verbatim, as the third section of the Act of March 11, 1842, which is entitled, "An act for regulating and maintaining line fences and for other purposes," and does not purport to be a supplement to the Act of 1700, or any other act, but an entirely independent enactment, which the Supreme Court in *Odenwelder vs. Frankenfield*, 153 Pa., 526, treats as still in force.

The fence in controversy was an existing division or partition

fence, between the improved lands of the plaintiff and defendant, and its regulation and maintenance was therefore governed by the provisions of the Act of 1842.

Whether, since the repeal of the first section of the Act of 1700, neighbors who improve adjacent lands, can be compelled to erect a division fence where none exists, it is now necessary to determine, as in the present case there was a division fence in existence.

Nor do we think the defendant's second objection tenable. The fourth section of the Act of 1842 requires the viewers to "make out a certificate in writing setting forth whether, in their opinion, the fence of one has been already built is sufficient, and, if not, what proportion of the expense of building a new or repairing the old fence should be borne by each party, and, in each case, they shall set forth the sum which in their judgment each party ought to pay to the other in case he shall repair or build his proportion of the fence."

While the original certificate does not set forth what proportion of the expense should be borne by the defendant, or the sum which he ought to pay to the plaintiff for the repairs made by him on defendant's portion of the fence, it does state that fifty-eight panels of defendant's fence require resetting with new posts and that sixty-one panels require repairing, thus furnishing the data from which the defendant can form his own judgment of the expense, instead of being compelled to rely upon the mere judgment of the viewers given without data; and is in our opinion a substantial compliance with these directory requirements of the act of Assembly.

Besides, the opinion to state the amounts in dollars and cents, even if necessary, has been supplied by the supplemental statement and the oral testimony of Walter S. Wyatt.

The defendant here had ample time, more than the law required should be given him, in which to commence the repair of his fence before it was undertaken by the plaintiff; and instead of having the mere judgment of the viewers as to what the expense was likely to be, he has now the actual cost, which he does not dispute, and we cannot therefore see that he has in any way been injured or wronged.

We direct that judgment be entered by the prothonotary, in favor of the plaintiff for the sum of twenty-six dollars and sixty-eight cents, with costs, unless exceptions shall be filed to this decision within thirty days after notice given by the prothonotary, as directed by the Act of Assembly of April 22, 1874, under which this case was heard."

Section 1 of the Act of May 11, 1842, makes the auditors of the township the fence viewers.

Section 2 provides for filling vacancies caused by the death or resignation of an auditor.

Section 3 provides: "When any two persons shall improve lands adjoining to each other, or where any person shall enclose any land already fenced in so that any part of the first person's fence becomes a partition fence between them, in both of these cases the charge of the division fence, so far as is enclosed on both sides, shall be equally borne and maintained by both parties.

Section 4 provides for the manner in which the fence viewers (auditors) shall perform their duties, and also how they are to be notified by parties dissatisfied with a division fence.

Section 5 provides for action in cases in which the person interested refuses or neglects to comply with the finding of the fence viewers, as follows:

"If the party who shall be delinquent in making or repairing any fence shall not within ten days after a copy of the certificate of the viewers shall have been delivered to him, proceed to repair or build the said fence and complete the same in a reasonable time, it shall be lawful for the parties aggrieved to repair or build the said fence, and he may bring suit before any justice of the peace or alderman against the delinquent party and recover as in other actions for work, labor, service done and material found, and either party may appeal from the decision of the justice or alderman, as in other cases.

Accepting the decisions of the Supreme Court and of the Chester county court as final, we may assume that all line or division fences are governed by the provisions of the Act of March 11, 1842, and that under the provisions of this act, the rights of the two interested parties are plainly determined, and a means provided for the settlement of all disputes.

Peach Rot.

Prof. Chester, of the Delaware Experiment Station, has recently conducted a series of experiments with fungicides in order to ascertain whatever they may be made available as a preventive of the peach rot, which has caused so much loss to Delaware growers. The results of his experiments, while not to be accepted as those of a completed experiment, are interesting, and indicate that spraying, when properly conducted, will prevent a large percentage of the annual loss from rot.

The experiments made at the station and under the guidance of the station officers at several other points in the peach districts, were made with the following four fungicides:

1. Ammoniacal Solution of Copper Carbonate—Dissolve five ounces of copper carbonate in three pints of strong ammonia, then dilute with 45 gallons of water.

2. Ammoniacal Solution of Copper Carbonate with Ammonium Carbonate—Mix eight ounces of copper carbonate and one pound of ammonium carbonate; dissolve the mixture in hot water and then dilute with 45 gallons of water.

3. Copper Carbonate in Suspension—One pound of copper carbonate in suspension in 25 gallons of water.

4. Neutral Bordeaux Mixture—Dissolve four pounds of copper sulphate in hot water; cool the solution by mixing with six or eight gallons of cold water. Then add milk of lime cautiously until red litmus paper (obtained of any druggist) dipped into the mixture just begins to turn blue. Then dilute with water to 25 gallons.

In an experiment conducted near Seaford, Delaware, fungicide No. 1 was used; the trees were sprayed April 29, or just as the early blossoms were beginning to fall; examination showed that, even previous to the application, a proportion of the blossoms were blighted by the peach rot fungus, and it is therefore evident that the application was delayed until too late a date. Applications were afterwards made as follows: May 18, May 28, June 9, June 21 and July 2.

Careful estimates gave the following as the comparative results of spraying with each of the four fungicides and also the yield of unsprayed trees. The percentages show the amount of rotted fruit in each case:

No. 1,	19.68 per cent.
No. 2,	13.00 per cent.
No. 3,	13.92 per cent.
No. 4,	17.99 per cent.
Unsprayed,	32.70 per cent.

In condensing his conclusions Prof. Chester thus sums up:

1. I would therefore urge that no mummified fruit be allowed to hang on the trees through the winter, but that it be removed, either at the time of picking, or soon after.

2. Early in the spring, before the fruit buds begin to swell, spray the trees with a solution containing one pound of copper sulphate to 25 gallons of water.

3. As soon as the fruit buds just begin to swell, spray the trees with either of the fungicides (2), (3) or (4). Follow this by another spraying before the buds open. The object of the preceding applications is to protect the blossoms from the blight mentioned in the accounts of the experiments at Seaford.

4. As soon as the fruit shall have reached full size and begins to show signs of color, make a third application. This should be followed by two or three other applications at close intervals of five or seven days, during the ripening period."

Potato Blight.

In the report for last year (pages 84-85), we stated that recent experiments at the Vermont Station made it probable that there were two distinct kinds of blight affecting the potato crops of 1891 and 1892, and that they are not only different in their effects, but also different in the time of their attacks and in the circumstances which favored their propagation; we then stated the distinguishing points, as follows:

1. The old form of blight attacks the leaf at any point, and generally works rapidly. In the new disease the leaf begins dying at the tip and dies slowly backward, the leaf drying and curling meanwhile, and the whole progress of the disease is comparatively slow.

2. In the true blight the black spots on the leaves are fringed on the under side by a delicate fungus growth; in the new disease this is never found.

3. The true blight may be expected in the latter part of the summer, especially in August, and only during warm, wet weather. The new disease may be expected earlier and develops in cooler and dryer weather.

4. Following the blight the tubers may be expected to show more or less rot, especially dry rot, if the soil is heavy or moist.

Another year's experience and experiments at the station has enabled Prof. Jones to give the following distinguishing points between the two kinds of blight:

EARLY BLIGHT.

1. Apparently a "new disease," economically.
2. Attacks early potatoes. Worst in July.
3. Progresses slowly. Not checked by dry, cool weather.
4. Shows as several or many small, dead spots (slowly enlarging and merging together later) scattered over the leaf. Leaf often dies at tip and edges first.
5. Owing to slow progress and dry weather the dead portions dry, crisp and curl up, especially at the tips and edges of the leaf.
6. Caused in part by the fungus *Macrosporium Solani*.
7. Which causes peculiar "target board" markings in the dead spots.
8. Disease is confined to the tops. No rotting of the tubers.
9. The loss is, therefore, such as results from premature death of the vines.
10. Can probably be checked by applying Bordeaux mixture three to five times, beginning (on early potatoes) early in July.

LATE BLIGHT.

1. Has been common for 50 years or more.
2. Attacks medium and late potatoes. Worst in August.
3. Progresses very rapidly, and only during the moist, warm weather.
4. Shows anywhere upon the leaf, generally as a single spot which rapidly spreads over the whole leaf.
5. Owing to the rapid progress and wet weather, the diseased leaf does not usually have time to dry and curl until the entire leaf is dead.
6. Caused by the fungus *Phytophthora Infestans*.
7. Which can often be seen as a delicate frost-like mildew.
8. Disease passes from leaves to tubers, causing "rot."
9. The loss is, therefore, two-fold: (a) Premature death of vines; (b) rotting of tubers.
10. Both blight of tops and rot of tubers can be prevented by two or three applications of Bordeaux mixture, beginning, generally, the latter part of July.

Prof. Jones, with the results of the past year's experiments and experience before him, wrote thus in relation to what he believes to be a comparatively new disease to the potato crop:

"Large numbers of specimens were sent to us for examination from various parts of the State. We are still in some doubt as to the cause of part of this trouble, and do not think that any one thing is wholly responsible. Leaves that had been attacked by insects seemed to suffer worst, many of the dead spots having at their centre one or more of the holes eaten by the flea beetles. Large numbers of leaves were sent to us that had evidently been killed by too much Paris green, some of them being literally coated with this poison.

But neither Paris green nor insect injuries can account for all of the serious blighting of early potatoes throughout the State last summer. The trouble began to show about the middle of July, and by the first of August was general and serious. The leaves blackened and



FIG. 1.



FIG. 2

POTATO BLIGHT.

1. EARLY BLIGHT.

2 LATE BLIGHT.

curled at the tips and edges first; or often spots appeared scattered over the leaf, which gradually enlarged and merged together. Owing to this slow progress, the dead parts generally became dry and crisp, and often broke away, leaving the leaf ragged.

In many leaves examined we were unable to find any trace of fungus attack. In the large majority, however, we found a *macrosporium*, apparently *Macrosporium Solani*, E. & M. Specimens were sent to Prof. B. T. Galloway, who pronounced it this species.

As no cultural experiments or inoculations were made, we cannot say with certainty that this *Macrosporium* is the cause of this disease, yet the general association of this fungus with the disease leaves little doubt in our minds that it was the cause of a large part of the trouble last summer. Apparently insect punctures or other injuries to the leaf, offer a favorable starting point for this fungus. The further fact should be noted that this disease does little damage until after the plants blossom and pass their stage of greatest vigor. Many potato growers were misled by this fact into believing that their potatoes merely "ripened off" unusually early last summer. The lightness of the yield and the appearance of the tubers show, however, that the vines died prematurely. Where we examined the tubers of these early potatoes, their appearance indicated immaturity, and in this opinion we have been confirmed by some of our best practical potato growers. We believe that few, if any, early potatoes in the State matured fully last summer, and, as explained on page 66, such premature death of the vines always means a serious shortening of the crop, aside from injury to its quality. Many potato growers who realized that their plants were diseased attributed the trouble to the common or *Phytophthora* blight."

Prof. Jones, supposing that sooner or later the new form of disease will appear in all portions of the country, proposes to call the older form of blight, or the *Phytophthora* form, the "potato mildew," and the new blight, or the *Macrosporium* form, the "leaf spot disease;" but, fearing the trouble which always ensues when an attempt is made to change or modify a generally accepted name, he suggests that they be styled early and late blight.

Imitation Dairy Products.

Section 1 of the Act of May 21, 1885, provides: "That no person, firm or corporate body shall manufacture out of any oleaginous substance, or any compound of the same, other than that produced from unadulterated milk, or of cream from the same, any article designed to take the place of butter or cheese produced from pure, unadulterated milk or cream from the same, or of any imitation or adulterated butter or cheese, nor shall sell or offer for sale, or have in his, her or their possession with intent to sell the same as an article of food."

Sections 3 and 4 of the same law provide penalties for violations of the law; section 3 imposes a penalty of one hundred dollars, one-half of which, on conviction, is for the use of the prosecutor. Section 4 imposes a penalty of from one hundred to three hundred dollars, or imprisonment for thirty days, or both, at the option of the court.

The operation of this law has been handicapped somewhat by the fact that the law of the United States provides for license for persons

who propose to offer or sell imitation butter or oleomargarine, and the seeming contradiction has, at least to a certain extent, rendered the enforcement of the law of 1885 difficult.

In order to meet this difficulty and provide for the more thorough enforcement of the Act of 1885, the Legislature of 1893 enacted the following, which was approved by Governor Pattison, May 26, 1893:

AN ACT

To enlarge the powers of the State Board of Agriculture, to authorize the said Board to enforce the provisions of the act entitled "An act for the protection of the public health, and to prevent adulteration of dairy products and fraud in the sale thereof," approved May twenty-one, Anno Domini one thousand eight hundred and eighty-five, and of other acts in relation to dairy products, to authorize the appointment of an agent of the said Board who shall be known as the "Dairy and Food Commissioner," and to define his duties and fix his compensation, being supplementary to an act entitled "An act to establish a State Board of Agriculture," approved May eighth, Anno Domini, one thousand eight hundred and seventy-six.

Section 1. *Be it enacted, etc.*, That the State Board of Agriculture be and is hereby empowered and charged with the enforcement of the provisions of the act entitled "An act for the protection of the public health, and to prevent adulteration of dairy products and fraud in the sale thereof," approved May twenty-one, Anno Domini one thousand eight hundred and eighty-five, and with the enforcement of the various provisions of all other laws now enacted or hereafter to be enacted, prohibiting or regulating the adulteration or imitation of butter, cheese or other dairy products.

Section 2. That for the purpose of securing the enforcement of the provisions of the said laws concerning dairy products, the President of the said State Board of Agriculture be and is hereby authorized and empowered to appoint an agent of the said Board, who shall be known by the name and title of the "Dairy and Food Commissioner," who shall hold his office for the term of two years or until his successor shall be duly appointed and qualified, and shall receive a salary of two thousand dollars per annum and his necessary expenses incurred in the discharge of his official duties under this act. The said agent shall be charged, under the direction of the said Board, with the execution and enforcement of all laws now enacted or hereafter to be enacted in relation to the adulteration or imitation of dairy products.

Section 3. That the said agent of the said Board, the said Dairy and Food Commissioner, is hereby authorized and empowered, subject to the approval of the said State Board of Agriculture, to appoint and fix the compensation of such assistants, agents, experts, chemists, detectives and counsel as may be deemed by him necessary for the proper discharge of the duties of his office, and for the discovery and prosecution of violations of the said laws: Provided, That the entire expenses of the said agent and all of his assistants, agents, experts, chemists, detectives and counsel (salaries included), shall not exceed the sum appropriated for the purposes of this act.

Section 4. That the said agent of the said State Board of Agriculture

ture and such assistants, agents, experts, chemists, detectives and counsel as he shall duly authorize for the purpose, shall have full access, egress and ingress to all places of business, factories, farms, buildings, carriages, cars, vessels and cans used in the manufacture, transportation and sale of any dairy products, or of any adulteration or imitation thereof. They shall also have power and authority to open any package, can or vessel containing dairy products, or any adulteration or imitation thereof, which may be manufactured, sold or exposed for sale in violation of any of the provisions of any act now enacted or which may be hereafter enacted in relation to dairy products, or the adulteration or imitation thereof, and they shall also have power to take from such package, can or vessel samples for analysis.

Section 5. That all penalties and costs received by the said State Board of Agriculture for violations of the said act of May twenty-one, Anno Domini one thousand eight hundred and eighty-five, and of other acts now enacted or hereafter to be enacted prohibiting or regulating the adulteration or imitation of butter, cheese or other dairy products, shall be appropriated by the said Board to the payment, only, of the necessary expenses incurred by the said Dairy and Food Commissioner and his assistants and agents in the investigation, discovery and prosecution of violations of the said act.

Section 6. That all charges, accounts and expenses of the said Commissioner, and of all the assistants, agents, experts, chemists, detectives and counsel employed by him shall be paid by the Treasurer of the State in the same manner as other accounts and expenses of the said State Board of Agriculture are now paid, as provided by law.

Section 7. That the said Commissioner shall make annual reports of his work and proceedings and shall report in detail the number and names of the assistants, agents, experts, chemists, detectives and counsel employed by him, with their expenses and disbursements, the number of prosecutions, the number of convictions, and the penalties recovered in each case, which report shall be presented to the State Board of Agriculture at its annual meeting.

Approved the twenty-sixth day of May, Anno Domini, one thousand eight hundred and ninety-three.

Under the provisions of this act, Governor Pattison appointed Eastburn Reeder, member of the State Board of Agriculture from Bucks county, "Dairy and Food Commissioner," and he has, during the past year, been taking such action as the means at his command would permit. The fact that the Legislature failed to make any appropriation for his salary and expenses has seriously crippled the action of the Commissioner, but he has taken such steps as were possible under the circumstances and has faith that the coming Legislature will provide for the department which a previous one created.

Since the appointment of Mr. Reeder, the Supreme Court has rendered a decision in the case of the Commonwealth vs. George Schollenberger, on an appeal from the court of common pleas of Philadelphia county, which materially strengthens the enforcement of the act of May 21, 1885. Those who violated this act had heretofore taken shelter under the decision of the United States Courts in the cases involving the celebrated "original package" decision (*Liesey vs. Har-*

din-135, U. S. Rep., 100), in which Judge Williams handed down the opinion from which we extract the following points:

"The defendant, Schollenberger, is a citizen and resident of this State. For at least two years he has been living under the protection of its laws and is bound by all the obligations that such residence and protection impose. He is a merchant, with a store in the city of Philadelphia. He sells his goods to customers, as other merchants sell their goods, from his stock in store, open to their examination. The commodity, or one of the commodities in which he deals is oleomargarine, for the sale of which, at his store in Philadelphia, he has obtained a license under the internal revenue laws of the United States during the last two years. He sells, not for shipment in original packages to other countries or states, but to local consumers, and in the case now before us, to an eating-house keeper for consumption upon his table as an article of food.

Now, our statute explicitly forbids the sale, the keeping and the offering of oleomargarine for sale as an article of food. The identical acts forbidden by the law are thus seen to be the acts which he admits he is engaged in, and which he claims the right to do, notwithstanding his residence in and the statutes of the State. This right he claims to derive from the inter-state commerce clause in two ways. The first of these rests on the non-residence of the manufacturer. He asserts that the oleomargarine is made in another State. Because the manufacturer can lawfully make and sell under the laws of the State where the manufactory is located, he contends that the manufacturer can sell his own product anywhere, and for this purpose can establish stores for its sale all over the State if he chooses to do so. As the manufacturer may do this in person, it is contended that he can do it by an agent, so that he could have as many stores, conducted by as many agents, as there are towns in the Commonwealth, and conduct the trade in them all, regardless of the police laws of the State. The second line along which he claims to derive immunity is the "original package" doctrine. He says he sells in the packages made up in the factory. He does not divide a roll, a pail or tub of his "goods," but requires the purchaser to take the entire roll, pail or tub made, filled or shaped at the factory. We think neither of these positions should avail the defendant. We do not deny that a non-resident manufacturer may sell his goods and ship them to a buyer in the usual trade packages employed in good faith by the manufacturers, without being amenable to the police laws of this State therefor. He may bring them here and hold them in bulk without danger; so much is fairly ruled in *Leisey vs. Hardin*. We might have held, had the question been one for us, that the object of the inter-state commerce clause was quite different from what it seems thought to be. We might have thought it intended to prevent the establishment of state custom houses and taxation along state lines, and to make for the general purposes of legitimate trade, all the states open to the manufacturer and merchants of the several states. But for this the states might have intercepted all goods reaching their borders and weighed and valued and taxed them before permitting them to proceed to their destination. The destructive effect upon commerce of such restrictions was clearly foreseen and wisely guarded against by

our fathers. But the protection of the lives, the health and morals of citizens was the chief of the duties of the government left to the states when the Union was formed. The common law rights and remedies are to be sought in the courts of the states. For this reason we would have held that the police regulations of the states stood impregnable ground, and that while no state had the right to tax or to burden inter-state commerce, each state had the right to exclude from its territory such articles of food or drinks as were injurious in their character and effects upon the health or morals of the public. But, however this may be, it will not be denied that state commerce, that is, business conducted within the lines of a state, was left to state control."

* * * * *

"When a non-resident of Pennsylvania comes into the State to embark in business here, his situation is like that of any other resident, and his business done at the store is State and not inter-state. It does not matter where he obtains his goods. Inter-state commerce does not necessarily depend on the origin of the goods; or rather, all men who buy and sell foreign merchandise are not necessarily engaged in inter-state commerce. If it was otherwise, all merchants would be superior to State laws, for all deal to some extent in goods made in other states and in other countries. It is not simply and mainly the origin of the goods, therefore, that is to be considered, but the nature of the business done. One who keeps a stock of goods in store for the inspection of customers and sells from this stock to actual customers is a local dealer. His business is intra-state, and not inter-state. Our act of 1885, under which this case arises, is not a trade regulation. It is a police law. This court has so held repeatedly, and our view of it was expressly confirmed by the Supreme Court of the United States in *Powell vs. the Commonwealth of Pennsylvania* (127, U. S. 678), a case which turned upon that single question. It does not undertake to deal with an importer from any other country or state, but with manufacturers and dealers within the State. It prohibits the manufacture of oleomargarine within the limits of the State. It also prohibits the sale, the offer to sell, and having in possession with intent to sell the same 'as an article of food.' It lays its prohibition on those who are fairly subject to its jurisdiction, and on no others. We have, then, a valid police law, so declared by the highest tribunal in the land, which prohibits the sale of oleomargarine as an article of food within the State. We have the proprietor of a store located and licensed here making sales of the prohibited article to customers for the prohibited purpose. It does not matter that the merchant makes his home in another state, or that he makes his sales by a clerk or agent, rather than in person. He is a local dealer, selling in violation of the local law, and liable to its penalty. If the residence of the dealer could affect the character of his trade, then our police laws intended to protect our own people would operate as a discrimination against our citizens and in favor of citizens of other states, and would commit to those having no inter-

ests in common with us, a most odious monopoly in every kind or form of traffic which our State should attempt to regulate or suppress.

Intrenched behind the inter-state commerce clause so construed, citizens of other states could prey upon our people, trample upon our laws, and make gain out of a traffic forbidden to our citizens, only to be delivered up absolutely and unconditionally to them. It would require only that such citizen of another state should establish a local store in some of our towns or cities, or in all of them, and conduct a local business to meet a local demand, and when called upon by officers of the law, make reply that he made the goods in some other state, and, as a manufacturer, supplied himself as a local dealer with wares of a foreign origin. Neither the foreign origin of the goods sold, nor of the seller, nor both together, will convert a business that is local and intra-state into one that is general and inter-state within the meaning of the Constitution of the United States."

In closing the opinion the Court holds as follows: "To hold otherwise would make it impossible for the people of any state to protect themselves from evils that, by common consent throughout the civilized world, need to be restrained and removed by suitable legislation. It would also strike a blow of absolutely crushing weight at the existence of the police power in the several states, and render all attempts at its exercise ineffectual and useless."

This opinion of the Supreme Court, confirming as it does the constitutionality of the act of 1885, adds strength to the Commissioner, and, it is believed, will enable him to effectually carry the act into effect.

The only source of revenue at Mr. Reeder's command will be derived from fines and penalties, which, under the provisions of the act of May 26, 1893, are set apart for "the payment only of the necessary expenses incurred by the said Dairy and Food Commissioner and his assistants and agents in the investigation, discovery and prosecution of violations of the said act."

Mr. Reeder, being an officer of the State Board of Agriculture, will, under the express provision of section 7 of the act, make a full report at the annual meeting of the Board of Agriculture; to this report the reader is referred for definite and particular information as to the work accomplished.

At the spring meeting of the Board at Bethlehem, the question of the action of the State Dairy and Food Commissioner having been brought up, the following discussion ensued:

HON. W. H. McCULLOUGH, OF ALLEGHENY. Has the money been appropriated for the salary of this officer and for the expenses of carrying the act into effect?

HON. R. E. PATTISON, GOVERNOR. No, sir; no appropriation of any kind has been made. The act of Assembly will have to be enforced this year with a great deal of caution. The Factory Inspector act passed a few years ago, and with it as in this case, the Legislature failed to make an appropriation for carrying the act into effect. The department, however, went on, and the subsequent Legislature appropriated for the term where they had failed, alleging that it was an oversight. The Banking Department, which was created two years ago by the act of 1891, was left without any appropriation. The

Bank Examiner simply went ahead without incurring any great liability. Of course there can be no expenditure of money on the part of the State or on the part of a State officer without a specific appropriation. Whatever the Dairy Commissioner may do he undertakes at his own risk. My disposition was to give the act whatever force and effect it could have, after conferring with the friends of the measure, by signing it. The effect of the act, however, is largely destroyed by the failure to make an appropriation to carry it into execution. There may be no question about an appropriation by the next Legislature, and yet they may absolutely refuse to make any. All expenditures of money, and all liability, must be borne by the Commissioner, but, just as it was in the case of the Factory Inspector and Bank Examiner, he can take the risk and go ahead and enforce the law as far as he deems it prudent.

I signed the act for the purpose of giving the persons who were violating the act of 1885 notice that we proposed to enforce it, if possible. I would advise the Commissioner that if any question should arise in the future, any expenditure which he may make is at his own risk. If this Board, individually, pay the money out of their own pockets, they also do it at their own risk. The Legislature may meet this appropriation without any objection, but that is the difficulty under which the law now operates.

SECRETARY EDGE. Is it not a fact that the Act of 1885, or some other law passed previous to the one which we are now discussing, gives the prosecutor one-half of all penalties collected under its provisions? Could not the Commissioner prosecute and use the funds thus obtained for his expenses?

GOVERNOR PATTISON. That is correct; the penalties thus obtained become the property of the State Board of Agriculture, and can only be used for the purposes of carrying this act into effect and in paying the expenses of the officer authorized by the act. I see no objection to Mr. Reeder going ahead and enforcing the act of 1885; he can exercise all the powers given by either act, but of course, his compensation and expenses in so doing are at his own risk. The Bank Examiner went ahead, organized his department, employed clerks, and notified them that if the Legislature made no appropriation, they could obtain no pay. The Bank Examiner contracted no large bill of expenses, and based all his work upon the action of the subsequent Legislature making an appropriation.

R. S. SEARLE, OF SUSQUEHANNA. This is an important question to the dairy interests of our State, and no time should be lost in enforcing the provisions of the act. I strongly favor the course mapped out by the remarks of the Governor; let the Commissioner go ahead and do all that he can without incurring too much expense; he can have his blanks printed at the State Printing office, as the Governor has suggested, and can in this manner do much to enforce the law and to get his office upon a footing which will put him into a position to act when the Legislature does make the proper appropriation. I would suggest that he may possibly obtain funds from the creamery men, by basing his promise to repay it upon the contingency of the coming Legislature making an appropriation for the two years not provided

for. I have no doubt the manufacturers of butter and cheese would be willing to contribute for the sake of having the act enforced.

D. Z. SHOOK, OF FRANKLIN. I would suggest that the remarks of Governor Pattison are exactly to the point and that they furnish the Commissioner with a basis upon which to act. I would also suggest that the members of the Board, as they are at least indirectly responsible for action under the new law, can materially assist the Commissioner by action and public opinion in their own districts; they are scattered all over the State and can influence public opinion in relation to the Commissioner and his duties.

D. W. LAWSON, OF ARMSTRONG. While I believe in the right of the Commissioner to enforce the provisions of this act, there is a lack in one feature of the bill in that it does not extend far enough. I have been in Mr. McCullough's county (Allegheny), and know that there there is strong opposition to the act; and I have no doubt but that there was organized opposition to any appropriation for the Commissioner, and that his opposition will exist in the next Legislature as it did in the last.

HON. J. J. THOMAS, OF CAMBRIA. As a member of the last Legislature I had an opportunity of knowing something about the opposition to an appropriation for carrying out the provisions of this act, and I must say that this opposition was very intense and also very determined, and there is no doubt that it will exist in the next Legislature to an even greater extent. I would therefore advise the Commissioner to proceed very cautiously and incur no expenses that he will not want to pay himself, in case no appropriation is made. It would have required very little to have defeated the bill in the last Legislature, and the agitation which will follow any attempt to enforce it will be felt and may result in its defeat by the next Legislature.

Feeding Value of the Corn Crop.

If the introduction of the silo does not accomplish anything further than to direct the attention of farmers to the possibility of loss in a wasteful manner of harvesting and feeding their corn crops, it will have accomplished much for the advancement of scientific feeding, and if our experiment stations are to be valued solely for the result of their experiments in this direction, they are safe in the estimation of practical farmers.

Practical feeders now realize that in an acre of corn they have a certain amount of feeding value, and the problem now presented to them for solution is that of harvesting, curing and feeding the crop with the least possible loss of this food value. They are anxious to ascertain the plan by which, without an increase in expenses beyond the amount of food saved, they can obtain the greatest amount of milk or butter from the crop of a given area.

One of the most practical experiments in this direction is that of the Vermont Experiment Station, under the direct charge of Professor Cooke; a corn crop was divided into four equal portions and treated as follows:

"One-fourth was run through a cutter and cut into quarter-inch pieces and put into the silo, ears and all. This was called "whole en-

silage." The second quarter, called "stover ensilage," had the ears picked off in the field, then the stalks run through the cutter and put into another silo. The ears, after lying on the ground for a few days, were brought to the barn, husked, and the ears dried and ground into cob meal. The husks were run through the cutter, and, together with the meal, fed to the cows that were eating the stover ensilage. The third part, called the "corn fodder," was placed in large stooks near the barn, the top of the stooks being bound very tightly so as to shed rain and snow, and as fast as needed this corn fodder was taken into the barn, run through the cutter, and fed, ears and all, together. The last quarter, called the "corn stover," was treated the same as the corn fodder, except that when it was taken into the barn the ears were picked off, dried and ground, and the resulting meal fed at the same time with the cut stalks.

Twelve cows were used, divided into four groups, and the manner of feeding was so arranged that each cow was fed at one time or another on each of the four portions, and at the end of the experiment, which lasted five months, there had been the same number of cows for the same number of days on each one of the four portions.

Each cow was given ten pounds of very fine clover rowen, three pounds of wheat bran, and two pounds of corn meal daily, and in addition all she would eat of the fodder corn in some form or other.

The experiment went through very successfully. The corn kept well in all the different ways, was relished and well eaten by the cows, and none of the cows were sick or even off their feed during the whole five months. Every milking was weighed and the milk analyzed for twenty-four milkings out of each feeding period, which lasted twenty-eight days. Full records were kept of weights as harvested, amounts fed, orts and residues, with a very large number of samples for chemical analysis."

The experiment, as above outlined, presents the problem in four practical forms, either of which will be fully understood and appreciated by practical dairymen. The first involves the questions of the silo and ensilage and is valuable not only for this reason, but also because it brings this system in close contrast with the more common one of cutting, shocking, husking, shelling and grinding with which all are so familiar.

The following table shows, in a compact form, the result of the experiment so far as the weights of the product of the several plots is concerned.

In all the discussion of this experiment, whole ensilage means the entire corn plant, ears and all, put into the silo. Stover ensilage means the part that had the ears picked off, the stalks put in the silo, the ears husked, dried and ground, and the cut husks and cob meal fed with the stalks when taken from the silo. Corn fodder means the portion that was stooked, then fed, ears and all, without husking, but after being run through the cutter. Corn stover means the portion that was stooked, but, when brought into the barn for feeding, had the ears picked off, leaving the husks on the stalks; the ears were dried and ground and the resulting cob meal fed with the cut stalks.

METHOD OF HANDLING THE CROP.	Weight as harvested—pounds.	Dry matter in crop as harvested—pounds.	Dry matter of crop saved ready for feeding—pounds.	Loss in dry matter—pounds.	Per cent. of loss in dry matter.
Whole Ensilage	32,825	7,532	6,173	1,359	18
Stover Ensilage	32,825	7,532	5,978	1,554	21
Corn Fodder	32,825	7,532	6,169	1,363	18
Corn Stover	32,825	7,532	6,230	1,293	17
Total.	131,300	30,128	24,550	5,569	
Average,	32,825	7,532	6,140	1,392	18

In order to draw correct conclusions from the result of the experiment, as shown by the above table, it is necessary to remember that the corn which was hauled to the barn and shocked there, was put into neat, round shocks and carefully tied at the top, and that it therefore represents a food value in excess of the average crop, which is often allowed to remain exposed in the field in small shocks until a portion of its value is lost from rain and exposure. The fact that the second lot, the stover ensilage, shows the greatest loss, is partially due to the fact that after the ears were shelled off they were allowed to remain in the field (to dry) during several heavy rains, and Prof Cooke states that the loss to this crop was mainly due to the loss to the grain and husks, from the above cause. In his report Prof. Cooke uses the following language in reference to the results of this table: "These four methods of preserving the corn crop seem to have about the same value when each is used at its best."

When the crop was fed to milk cows and the whole ensilage taken as the standard of value, the results are shown by the following table:

KIND OF FODDER.	Milk.	Total solids.	Fat.	Solids not fat.
Whole Ensilage	100	100	100	100
Stover Ensilage	97	97	97	97
Corn Fodder	97	98	99	98
Corn Stover	100	100	100	100
Average	98	99	99	99

Taking the average of the experimental periods of feeding, and assuming that this result would have been attained had the whole of each crop been consumed, the following table shows the result in milk and butter fat:

KIND OF FODDER.	Total dry matter saved ready for feeding—pounds.	Dry matter fed during experimental periods—pounds.	CALCULATED YIELD OF THE WHOLE CROP.	
			Milk—Pounds.	Fat—Pounds.
Whole Ensilage	6,173	2,473	12,169	498
Stover Ensilage	5,978	2,936	9,598	396
Corn Fodder	6,169	2,708	10,782	450
Corn Stover	6,239	3,149	9,630	394

Reducing the result to single acre of each crop, the tabulated result of the yields is as follows:

METHOD OF PRESERVATION.	YIELD FROM ONE ACRE.				
	Milk—pounds.	Total solids, pounds.	Fat, pounds.	Solids not fat, pounds.	Equivalent of butter, pounds.
Whole Ensilage	8,113	1,067	333	735	398
Stover Ensilage	6,399	849	264	585	317
Corn Fodder	7,188	961	300	661	360
Corn Stover	6,420	856	263	593	316

With the above table as a basis, we have the problem presented in a manner which readily enables us to compare the practical results (to the butter maker) of the four systems, and the question of ensilaging the crops depends upon whether a gain of eighty-two pounds of butter per acre will repay us for any possible extra expenses in putting the crop into the silo.

From the results of this experiment Prof. Cooke draws the following practical conclusions:

1. All four methods produced a good fodder, well preserved and relished by the cows.

2. The whole ensilage, the corn fodder and the corn stover saved about the same amount of dry matter ready for feeding; the stover ensilage saved three per cent. less than the others; the average of all was 82 per cent. saved, 18 per cent. lost.

3. There was no great difference in the amount of milk or butter produced by the different methods. The difference between the best, the whole ensilage, and the poorest, the stover ensilage, was about three per cent. The average of the two ensilages was the same as that of the two stoked fodders. The same is true of the average of the two stovers as compared with that of the two whole fodders.

4. The four methods of handling the crop produced no effect on the quality of the milk.

5. The cows ate very different quantities of dry matter when on the different portions to produce equal quantities of milk and butter.

6. For each 100 pounds of dry matter in the whole ensilage eaten, the cows ate 119 pounds of dry matter in the stover ensilage, 109 pounds from the corn fodder and 127 pounds of dry matter from the corn stover.

7. If all of each fodder had been fed out under the conditions of the experimental periods, with corresponding amounts of rowen and grain, the stover ensilage would have produced 82 pounds of milk for each 100 pounds produced by the whole ensilage. The corn fodder would have produced 92 pounds and the corn stover 82 pounds. The proportions are much the same with regard to the yield of butter.

8. One acre of the corn crop preserved as whole ensilage and fed with 4,313 pounds of clover rowen and 2,157 pounds of grain, produced 8,113 pounds of milk, 1,067 pounds of total solids and 398 pounds of butter.

9. The whole ensilage lasted the longest every time. Consequently it would take less of it to last a herd a given time. One acre of corn made into whole ensilage yielded as much return in milk and butter as 1.26 acres made into stover ensilage or 1.08 acres made into corn fodder or 1.26 acres handled as corn stover.

10. The drying and grinding of the ears of the stover ensilage and corn stover seem to have made them less digestible, and this is the reason why these portions have done so much poorer than the whole ensilage.

11. Husking, shelling and grinding the corn to make a bushel of meal costs in this State 16 cents, or more than a quarter of the market value of the meal.

12. This labor and expense is more than wasted, since the cows did better on the whole corn than on the ground.

13. Dry corn fodder, after being brought into the barn, is still undergoing fermentation and loss even when no heating can be detected. In the course of ten days this loss may easily be half as much as took place in the stook. These changes and losses take place less rapidly in cold weather than in warm.

14. The losses of dry matter and feeding value in ensilage are closely proportional to the losses in weight.

15. The ensilage at the time of usual opening of the silo has in it still nearly all of the feeding value that it had when put into the silo.

16. The large losses of feeding value that occur in the silo are almost entirely at the time of feeding out the ensilage.

17. These losses can be largely prevented by using small, deep silos that will allow the feeding of two to three inches from the surface daily.

18. This is especially true of ensilage to be used in place of a soiling crop in summer.

19. The ensilage in the lower portions of a silo is not so compressed and solid at the time of feeding as would be expected from its weight at the time the silo was filled.

The following extracts from the official report of the experiment are important, first, because they add another claim to the system of preserving the corn crop in the silo, and second, because the second quotation strikes directly at the system pursued by our dairymen of husking, shelling and grinding the crop.

"The labor required in feeding was largely in favor of the ensilage. It took nearly as much time and expense to bring the corn fodder to the barn and stook it as it did to run the corn through the cutter into the silo, but it took several times as much labor and expense to bring the corn from the stooks into the barn and cut and feed it as it did to take the ensilage out of the silo.

"Leaving out of account the bad effects of the drying and grinding, there is still a complete loss of all the labor and expense of the extra work. The usual charge in this State for husking is five cents a bushel, and it takes two bushels of ears to make a bushel of meal. The charge for grinding is from an eighth to a tenth of the meal, so that if meal is worth \$20.00 a ton, the cost of husking and grinding will be 16 cents for each bushel of 56 pounds of corn meal, without counting in the labor and expense of carrying to mill. This is more than quarter value of the total value of the meal, and, according to the results of these experiments, is money and labor worse than wasted."

Feeding Corn-Stalks and Straw.

In these days of small profits and close margins, supplemented as they are this year by a high price for good hay, the progressive farmer will naturally endeavor to use his rougher fodder to the best possible advantage and dispose of the more valuable kinds when he has a good market. As a guide to this course of action, the New Jersey Experiment Station, (Bulletin No. 96), has given the results of some experiments and proposes a number of rations for feeding horses, cattle and cows, which are calculated to use up coarse fodder without any loss in either flesh or dairy products, and thus enable the producer to dispose of timothy hay at the present good prices.

To establish a table of foods equivalent to good hay the following, from the report of Mons. Viger, French Minister of Agriculture, is quoted:

"Now that hay is risen to its present price, this commodity can only be obtained by those who keep animals for pleasure. The farmer cannot buy forage at present prices; yet it is an error to suppose that animals on the farm are condemned to suffer or perish if the hay crop fails, for there are countries where horses and cattle never receive any hay, and these countries are renowned for their cattle." He also gives equivalents of nutritive materials of various commodities for cattle, compared to 100 pounds of hay, a number of which are as follows: "100 pounds of hay, of good average quality, can be replaced by either 170 pounds of oat straw, 237 pounds of wheat straw, 150 pounds of husks of oats, 193 pounds of wheat chaff, 150 pounds of fresh leaves (poplar, ash, acacia, mulberry, oak, lime and elm), 80 pounds of dried leaves of the same, gathered when green, 275 pounds of pine leaves, 145 pounds of potatoes, 300 pounds of forage beet, etc." And in the matter of rations for maintenance, assuming 20 pounds of hay per day as providing the necessary nourishment for a horse of 1,000 pounds live weight, equivalent rations are: "(a) 12 pounds of hay, 5 pounds of oats; (b) 6 pounds of wheat straw, 8 pounds of oats; (c) 16

pounds of green leaves, 2 of straw, 3 of oats, and 2 of wheat; (d) 16 pounds of green leaves, 2 of straw, 2 of oats, and 2 of barley.

In his criticism of this report on hay equivalents, Prof. Voorhes thus writes: "These statements are valuable, not only in giving equivalents in nutrition, but in showing the wide range of vegetable products that may serve as substitutes for hay. They are actual substitutes mainly in furnishing the desired bulk, for it must be remembered that while these products in the amounts given may furnish the equivalent of nutrition, it does not follow that they would serve equally well in maintaining life if fed alone; that is, no amount of straw is an exact equivalent of a definite amount of hay, both in the kind and proportion of the nutritive compounds, fat, protein and carbo-hydrates, because of difference in chemical composition."

In alluding to the comparative merits of some of these proposed substitutes for hay, and the hay itself, Prof. Voorhes writes thus:

"The protein of a feed corresponds to the lean meat of the animal body, and to the casein of the milk, and serves as a direct source of these products in the body; the fat corresponds to the fat of the body and the butter fat of the milk, and serves as a source of these products as well as aiding in the maintenance of animal heat and energy; the carbo-hydrates serve chiefly for the production of animal heat and energy, though under certain conditions, are capable of conversion into fat.

The protein of straw and other coarse products after digestion is, pound for pound, quite as valuable, and serves its purpose quite as well as that contained in hay; this is also true of the other compounds, fat and carbo-hydrates, but in the straw the carbo-hydrates exist in much greater proportion to the others than in the hay, while the fat and protein are in less proportion, and are all combined with a larger amount of indigestible, woody matter in the straw than in the hay, thus rendering the digestion more difficult."

In compounding the following rations the Station has been governed by the following prices for products used. Cottonseed meal, \$28; linseed meal, \$29; gluten meal, \$20; dried brewers' grains, \$19; malt sprouts, \$18; buckwheat middlings, \$17.50; wheat middlings (brown), \$18.75; wheat bran, \$18, and where these prices do not correspond with those prevailing where this report is read, the proper changes must be made.

The rations proposed by the Station and which have been tested there, are as follows:

RATIONS FOR DAIRY COWS.

No. 1.	No. 2.	No. 3.
10 lbs. corn stalks.	6 lbs. clover hay.	10 lbs. corn stalks.
3 " corn meal.	8 " oats straw.	5 " wheat straw.
3 " hominy meal.	4 " corn meal.	4 " dried brewers' grains
6 " wheat bran.	4 " malt sprouts.	3 " wheat bran.
2 " cotton-seed meal.	3 " wheat bran.	2 " corn meal.
8 " roots.	3 " linseed meal.	2 " cotton-seed meal.
No. 4.	No. 5.	No. 6.
40 lbs. corn ensilage.	6 lbs. corn stalks.	10 lbs. corn fodder.
6 " malt sprouts.	6 " clover hay.	7 " dried brewers' grains.
4 " wheat middlings.	6 " corn meal.	5 " corn meal.
" linseed meal.	7 " dried brewers' grains.	1 " cotton-seed meal.
No. 7.	No. 8.	No. 9.
lbs. corn stalks.	6 lbs. clover hay.	12 lbs. clover hay.
" oats straw.	6 " wheat straw.	5 " wheat bran.
3 " gluten feed.	5 " corn meal.	5 " ground oats.
3 " dried brewers' grains.	3 " malt sprouts.	5 " corn meal.
5 " buckwheat middlings.	3 " gluten feed.	
	3 " linseed meal.	

RATIONS FOR HORSES.

No. 1.	No. 2.	No. 3.
8 lbs. timothy hay.	8 lbs. timothy hay.	6 lbs. clover hay.
6 " dried brewers' grains.	6 " corn.	4 " corn stalks.
6 " corn.	5 " wheat bran.	6 " corn.
	1½ " linseed meal.	4 " wheat bran.
		1 " linseed meal.
No. 4.	No. 5.	No. 6.
4 lbs. clover hay.	6 lbs. timothy hay.	6 lbs. timothy hay.
8 " wheat straw.	10 " corn stalks.	8 " oats straw.
5 " corn meal.	2 " wheat bran.	3 " wheat bran.
5 " wheat bran.	2 " corn meal.	2 " corn meal.
2 " linseed meal.		

FOR FATTENING STEERS.

No. 1.	No. 2.	No. 3.
10 lbs. corn stalks.	5 lbs. clover hay.	10 lbs. corn stalks.
5 " clover hay.	10 " oats straw.	8 " wheat straw.
6 " corn meal.	6 " corn meal.	6 " gluten feed.
5 " wheat bran.	6 " wheat bran.	5 " corn meal.
3 " cotton-seed meal.	3 " linseed meal.	3 " cotton-seed meal.

Commercial Fertilizers for 1893.

During the year just closed seven special agents of the Board were assigned the work of collecting samples of fertilizers under the provisions of the Act of June 28, 1879; these agents selected and sent in about 1,500 samples during the year. Among these there were numer-

ous duplicates, as each agent worked independently and had no means of knowing what the others were doing. The only bar established against duplicates was that agents should not duplicate their own samples, except by special instruction.

In several counties of the State every person known to be offering or selling fertilizers was visited and, as far as possible, samples drawn from his stock. In other counties visits were made to special neighborhoods and in many cases to certain dealers only; especially when the object was to obtain samples of a suspected brand or manufacturer. In a number of cases this precaution led to the entire withdrawal from the State of brands of fertilizers which were found not to be up to the guaranteed standard as recorded in the office of the Board, and it is impossible to estimate the advantage which has accrued to the purchaser from this mode of enforcing the law.

When the analysis of the chemist of the Board showed that a given fertilizer was below its guaranteed standard, another sample was tested if possible, and, in any event, the manufacturer was notified, and if the discrepancy was a material one and such as would seriously affect the interests of the consumer, the manufacturer was notified to withdraw the goods from the market. In this manner the entire manufacture, for the season of 1893, of one firm was taken from the market, re-mixed and brought up to the guaranteed standard and again offered for sale; in this single case the saving to the consumers of these particular brands was not less than \$2,000, with a still greater loss to the manufacturers.

Each season's experience clearly shows that, under the operation of our State law, manufacturers are not willing to take the risk of its violation, and that, year by year, the average value of our fertilizers is increasing without any corresponding increase in the price of the goods. This is due, not so much to the fact that reliable manufacturers are increasing the value of their brands, as to the fact that goods below the standard are being crowded out of the market and are being replaced by fertilizers of greater value.

During the fertilizer year ending August 1, 1893, one hundred and eighty-one manufacturers offered (either directly or through their agents), 725 brands for sale in our State. The majority of these were sampled and tested by our chemist and a full report made for public distribution to both manufacturers and consumers. The 725 brands may be sub-divided as follows:

Complete fertilizers,	490 brands.
South Carolina Rock,	93 brands.
Ground bone,	87 brands.
Alkaline fertilizers,	55 brands.

A careful review of this list indicates that there has been a very material increase in the consumption of alkaline fertilizers. This is a step in the direction of a greater use of complete fertilizers, for, in nearly every case, the alkaline fertilizer has replaced acidulated South Carolina rock. The main objection to the use of this class of fertilizers is that their price, as compared with the ingredients from which they are made, is too high.

In a majority of cases these fertilizers are composed of acidulated South Carolina rock and kainit or other cheap form of potash. If we value the S. C. rock at \$15.00 per ton and the kainit at \$14.00, it follows that the mixture can be sold at a fair profit for \$17.00 per ton, whereas their average selling price throughout the State is about \$22.00 per ton.

When applied in conjunction with barnyard manure, there can be no doubt as to the utility and profit, at fair prices, of this class of manures. Barnyard manure contains too large an amount of nitrogen for the general crop and the addition of phosphoric acid (S. C. rock) and potash (kainit) in the alkaline fertilizers, makes, with the yard manure, a well balanced fertilizer for almost any crop.

The results of the past season also indicate a decrease in the amount of ground bone (as such) used; this is largely due to the fact that dissolved S. C. rock offers a much more economical source of phosphoric acid, and to the further fact that the rock has largely supplanted the bone as a source of phosphoric acid in mixed fertilizers. This is further proven by the testimony of manufacturers who have informed us that it is almost impossible to find a market for an alkaline fertilizer in which bone is used as a source of phosphoric acid, the consumer not being willing to pay the increased cost occasioned by the use of the higher priced material.

By making use of a large number of analyses of the season of 1892-3, we find the following to have been the average analysis of each of the five kinds of fertilizers; for the purposes of comparison we have added similar data obtained from analyses of the season of 1891-2.

COMPLETE FERTILIZERS.

	1892-3.	1891-2.
Moisture,	11.27	10.83
Soluble phosphoric acid,	5.74	5.78
Reverted phosphoric acid,	2.72	2.87
Insoluble phosphoric acid,	2.47	2.75
Potash,	2.87	2.40
Nitrogen,	1.64	1.81
Commercial value,	\$28 78	\$28 35
Selling price,	29 69	29 05

DISSOLVED ANIMAL BONE.

	1892-3.	1891-2
Moisture,	9.34	9.56
Soluble phosphoric acid,	6.23	6.56
Reverted phosphoric acid,	3.81	4.15
Insoluble phosphoric acid,	4.00	3.55
Nitrogen,	2.70	2.06
Commercial value per ton,	\$30 42	\$30 72
Selling price per ton,	29 82	28 10

ACIDULATED S. C. ROCK.

	1892-3.	1892-1.
Moisture,	10.00	9.92
Soluble phosphoric acid,	10.36	9.80
Reverted phosphoric acid,	3.33	3.69
Insoluble phosphoric acid,	1.89	2.41
Commercial value per ton,	\$22 95	\$21 95
Selling price per ton,	18 46	18 00

ALKALINE FERTILIZERS.

	1892-3.	1891-2.
Moisture,	11.84	12.51
Soluble phosphoric acid,	8.37	7.78
Reverted phosphoric acid,	3.20	3.42
Insoluble phosphoric acid,	1.22	1.32
Potash,	2.02	2.04
Commercial value per ton,	\$24 50	\$24 07
Selling price per ton,	22 00	22 38

GROUND BONE.

	1892-3.	1891-2.
Moisture,	5.89	5.92
Insoluble phosphoric acid,	21.87	23.13
Nitrogen,	3.73	3.67
Commercial value per ton,	\$36 26	\$36 92
Selling price per ton,	33 49	32 88

A comparison of the average fertilizer for the two years, as above stated, leads to the following conclusions:

Complete Fertilizers.—The average complete fertilizer for last year contained more moisture and potash than that of the preceding year. It contained less of each form of phosphoric acid and also less nitrogen. Its commercial value was but 43 cents higher per ton, and its selling price was 64 cents more.

Dissolved Animal Bone.—The average dissolved bone of this year contained less moisture, soluble and reverted phosphoric acids, and more insoluble phosphoric acid and nitrogen. Its commercial value fell short of that of the former year by 30 cents per ton, and its selling price was \$1.72 more.

Acidulated South Carolina Rock.—The average sample of last year contained more moisture and soluble phosphoric acid and less reverted and insoluble phosphoric acid than the average sample of the preceding year. Its commercial value was \$1.00 per ton higher and its selling price 46 cents per ton more.

Alkaline Fertilizers.—The average sample of this year contained less moisture, reverted and insoluble phosphoric acid and more soluble phosphoric acid. Its commercial value was 43 cents per ton higher and its selling price was 38 cents lower.

Ground Bone.—The average sample of ground bone for the year ending August 1, 1893, was lower in insoluble phosphoric acid and higher in nitrogen than that of the preceding year. Its commercial

value was 66 cents per ton lower and its selling price was 66 cents higher.

In order that our readers may be able to compare the analysis and value, as well as the selling prices, of fertilizers of the years 1879-80, 1891-2 and 1892-3, we make use of the following table, in which the average analysis of each year is used in connection with the valuations of 1892-3 as the basis of the calculation:

COMPLETE FERTILIZERS.

	1879-80.	1891-2.	1892-3.
Moisture		10.83	11.27
Soluble phosphoric acid	4.64	5.78	5.74
Reverted phosphoric acid	4.68	2.87	2.72
Insoluble phosphoric acid	2.71	2.75	2.47
Potash	2.08	2.40	2.87
Nitrogen	2.04	1.81	1.64
Valuation	\$28.93	\$28.35	\$28.78
Selling price	35.25	29.05	29.69

ACIDULATED S. C. ROCK.

	1879-80.	1891-2.	1892-3.
Moisture		9.92	10.00
Soluble phosphoric acid	7.31	9.80	10.26
Reverted phosphoric acid	4.33	3.69	3.33
Insoluble phosphoric acid	6.08	2.41	1.89
Valuation	\$21.86	\$21.95	\$22.34
Selling price	27.00	18.00	18.46

GROUND BONE.

	1879-80.	1891-2.	1892-3.
Moisture		5.92	5.89
Insoluble phosphoric acid	20.76	23.13	21.87
Nitrogen	4.58	3.67	3.73
Valuation	\$38.24	\$36.92	\$36.26
Selling price	35.54	32.88	33.49

A comparison of the records of the three years given in the tables, leads to the following conclusions:

Complete Fertilizers.—From 1879-80 to 1892-3 there has been a decrease in the average available phosphoric acid, from 9.32 to 8.46; during the same time the insoluble phosphoric acid has been slightly decreased; owing to the introduction of special potassic fertilizers for potatoes the potash has been slightly increased; the nitrogen has been decreased; the valuation (both being calculated from the values of 1892-3) has undergone very little change, while the average selling price has been decreased to the amount of \$5.56 per ton; or that, in other words, our farmers are now buying the complete fertilizers which they now use for \$675,000 less than they would have paid for them in 1879-80.

Acidulated S. C. Rock.—Since 1879-80 there has been an increase of available phosphoric acid from 11.64 to 13.59, and a decrease of the insoluble from 6.08 to 1.89, or a total decrease of 4.19 per cent. The value has increased but 48 cents per ton, but the selling price has fallen \$8.34 per ton.

Ground Bone.—In this class of fertilizers there appears to have been a slight increase of phosphoric acid and a falling off in the percentage of nitrogen. During the same time the selling price has decreased \$2.02 per ton.

The Production of Manure.

In a recent experiment by Prof. Watson at Cornell Experiment Station, important items in connection with the production of manure were ascertained. Among these may be instanced the connection between the amount and character of the food and the amount and value of the resulting manure, the relative amounts of nitrogen, phosphoric acid and potash in the manure, and the relation of the amount of water consumed to the amount and character of the manure.

Tests were made with sheep, pigs, calves and horses; they were kept so that absolutely everything consumed was retained or given off in the form of excrement and urine, and its exact weight ascertained with certainty.

In the experiment with horses, the minutia of which we omit for want of space, the following table shows the results of the formation of the manure:

Total weight of horses,	6,410	pounds
Plaster used,	129	pounds
Straw bedding used,	112.75	pounds
Total weight of manure,	555	pounds
Value of excrement per year per 1,000 pounds live weight,...	\$27	74
Value of manure per ton,	2	21
Value of excrement per ton,	3	18

The analysis of the manure gave the following results:

Water, 48.69; nitrogen, 0.49; phosphoric acid, 0.26; potash, 0.48 per cent.

Four work horses and one two-year-old colt were put in for this experiment to test the results of 24 hours' feeding and manure forma-

tion; as a result it was found, as the average of a number of trials, that the manure had a value of .076 cents per day, or a total annual value of \$27.74, and that the excrement received (average) amounted to 48.8 pounds for each 1,000 of live weight.

The experiment with pigs appears to have been more complete and to have determined a larger number of doubtful points. The following tables give, in a condensed form, the result of this experiment:

FOOD CONSUMED.

No. of experiment.	Skim milk—pounds.	Corn meal—pounds.	Wheat bran—pounds.	Linseed meal—pounds.	Meat scrap—pounds.
1	110	64.4	.....	.....	32.1
2	168	59.32	.....	.....	29.66
3	185	4.57	4.57	6.86	.....

FOOD CONSUMED AND EXCREMENT RECOVERED.

NO. OF EXPERIMENT.	First.	Second.	Third.
Length of experiment in days	7.	7.	7.
Weight of pigs	412.	450.	333.
Pounds of food consumed	206.5	256.97	151.
Pounds of nitrogen consumed	4.698	4.723	1.34
Pounds of phosphoric acid consumed	2.29	2.27	.59
Pounds of potash consumed . . . . .	.589	.624	.322
Pounds of excrement recovered	330.5	342.25	130.75
Pounds of nitrogen recovered	3.317	3.481	1.33
Pounds of phosphoric acid recovered	1.70	1.45	.48
Pounds of potash recovered . . . . .	.534	.472	.323
Pounds of excrement recovered per day per 1,000 pounds live weight of animal	108.9	75.8	56.2
Value of excrement per day per 1,000 pounds live weight of animal	\$0.2108	\$0.186	\$0.104
Value of manure per ton	3.47	3.46	2.94
Value of excrement per ton	4.21	4.46	4.45

ANALYSES OF MANURE.

No. of experiment.	Water per cent.	Nitrogen per cent.	Phosphoric acid per cent.	Potash per cent.	Value per ton.
1	78.47	.88	.48	.29	\$3.477
2	74.68	.91	.40	.28	3.462
3	69.34	.74	.30	.40	2.94
Average	74.13	.84	.39	.32	\$3.29

An examination of the table, with the light given by the character of the food used by each lot during each day, shows that the high value of the excrement (daily) of the first two lots was due to the rich (in nitrogen) character of the food consumed. From the first table the reader will note that lots 1 and 2 consumed a considerable amount of meat scrap which cost \$35.00 per ton, and which contained about ten per cent. of nitrogen.

In reviewing this experiment Prof. Watson thus alludes to the results: "It will be noticed that the value of the excrement per ton is nearly the same in each of these three experiments, while the value recovered per day is nearly twice as much when the ration consisted of corn meal and meat scrap as when corn meal, wheat bran and linseed meal were fed. The highly nitrogenous ration greatly increased the liquid voidings and this, more than any other one thing, caused the great weight of total voidings per day without proportionately increasing the percentage of nitrogen."

The result of a similar experiment with cows is shown by the following table:

FOOD CONSUMED AND BEDDING USED.

No. of experiment.	No. of cows.	Hay—pounds.	Ensilage—pounds.	Beets—pounds.	Wheat bran—pounds.	Corn meal—pounds.	Cotton seed meal—pounds.	Straw used—pounds.	Total weight of cows—pounds.
1	18	220	825	95	73.6	17.4	29.	168.7	20,379
2	18	220	750	180	60.48	15.12	50.40	178.0	20,278
3	17	210	805	170	75.	15.	50.	156.	19,463
4	18	180	720	30	66.6	4.	41.4	114.5	19,790

During the test the cows were fed as they usually were during the winter, and no change, except that needed to keep a record of the voidings, was made in the regular habits of the herd; it is therefore claimed that this table very fairly represents the results in manure of the Station herd during the whole winter.

The result of careful analyses proves that the manure from the different herds had the following values per ton: No. 1, \$1.76; No. 2, \$1.97; No. 3, \$1.88, and No. 4, \$2.47, or an average value per ton of \$2.02.

The report gives no explanation for the great increase in the value of the manure from herd No. 4, as compared with the others, but this explanation can no doubt be obtained by a study of the variations in feed as shown by the preceding table; the result, in its minutia, is shown by the following table:

RECOVERED FROM ONE THOUSAND POUNDS OF LIVE WEIGHT OF ANIMAL, PER DAY.

No. of experiment.	Nitrogen—pounds.	Phosphoric acid—pounds.	Potash—pounds.
1	.303	.226	.120
2	.370	.216	.334
3	.343	.217	.283
4	.390	.324	.406
Average.....	.351	.245	.286
Average value.....	\$0.052	\$0.0147	\$0.012
Total value	\$0.0802		

A similar experiment made with sheep confined upon water tight galvanized iron pans, exhibits the results as set forth in the following table, and these results will be found well worthy of the careful study of all sheep feeders, as they furnish data found in no other experiment and in such a condensed form as to be specially valuable:

FOOD CONSUMED AND EXCREMENT RECOVERED.

NO. OF EXPERIMENT.	First.	Second.	Third.	Fourth.	Fifth.	Sixth.
Length of experiment in days	15.	12.	13.	16.	14.	21.
Weight of sheep	296.	318.	328.	343.	381.	234.5
Pounds of nitrogen consumed	1.92	1.48	2.298	4.345	4.25	2.445
Pounds of phosphoric acid consumed . . . . .	.531	.425	.814	2.12	2.19	1.12
Pounds of potash consumed	1.28	.949	1.078	2.299	2.14	1.43
Pounds of excrement recovered	140.75	137.50	199.25	296.	203.25	160.75
Pounds of nitrogen recovered	1.08	.994	1.80	2.83	1.59	1.758
Pounds of phosphoric acid recovered . . . . .	.35	.298	.665	1.466	1.08	1.106
Pounds of potash recovered	1.089	.830	9.63	1.06	.77	.541
Pounds of excrement recovered per 1,000 pounds live weight of animal per day	31.7	36.4	36.4	31.2	37.9	29.8
Value of manure per ton	\$3.16	\$2.65	\$3.30	\$3.49	\$3.15	\$4.17
Value of excrement per ton	3.35	3.01	4.55	6.62	3.44	4.85

A careful average of all the experiments of the series, of which we have noted but a few, is shown by the following tables, from which the value per ton of each kind of manure will be noted, but the reader must make due allowance for the fact that this valuation is placed upon the manure as soon as it is formed, and not after it has laid under a shed or out in the weather for five or six months, and

that, therefore, the mistake must not be made of crediting the ordinary farm barn-yard with these values.

ANALYSES AND VALUE PER TON.

Kind of manure.	Number of experiments.	Nitrogen per cent.	Phosphoric acid—per cent.	Potash—per cent.	Water—per cent.	Value per ton.
Sheep	6	.7675	.391	.591	59.52	\$3.30
Calves	2	.497	.172	.532	77.73	2.175
Pigs	3	.84	.39	.33	74.13	3.29
Cows	4	.426	.29	.44	75.25	2.08
Horses	1	.49	.26	.48	48.69	2.21

EXCREMENT RECOVERED PER ONE THOUSAND POUNDS LIVE WEIGHT OF ANIMAL.

Kind of animal.	Number of experiments.	Pounds per day.	Value per day.	Value per year.
Sheep	6	34.1	\$.0715	\$26.09
Calves	2	67.8	.067	54.45
Pigs	3	83.6	.1068	60.88
Cows	4	74.1	.0802	29.37
Horses	1	48.8	.076	27.74

In his summary, when referring to the comparative fertilizing value of different kinds of food, Prof. Watson writes thus: "Of the vegetable foods cottonseed meal has the greatest value in fertilizing constituents, and, as was the case with meat scrap, the greater part of the value is the proportionately large amount of nitrogen which it contains, and, also like meat scrap, the fertilizer value is equal to the selling price as cattle food in our markets."

It will be noticed that cornmeal has a low fertilizer value. Not only is it poor in phosphoric acid and potash, but it is low in nitrogen; the total value, \$5.66 per ton, being only a little more than two-thirds of the fertilizer value of clover hay. While corn meal ranks high as a food, its fertilizer value is low and often overestimated by many feeders. This over estimation in fertilizer value probably comes from estimating the fertilizer value from the feeding value.

The clover hay fed in this series of experiments had a fertilizer value of \$7.55 per ton, which is often as much as the selling price of clover hay. It is true with the hay also, that the greater part of the fertilizer value is in the nitrogen which it contains, although the mineral matter contained in the hay is considerably more than in the corn meal.

When we compare the fertilizer value of corn meal and clover hay we may expect greater value in the manure produced from a ton of clover hay than from a ton of corn meal.

Oats have a fertilizer value of \$6.70 per ton, which is greater than that of corn meal, but less than that of clover hay.

Wheat bran is the richest in mineral matter of our common concentrated foods, having a fertilizer value of \$12.30, of which phosphoric acid and potash has a value of \$4.74, being a much larger proportion of mineral matter than that contained in the other concentrated foods fed in these experiments."

Feeding for Pork.

At the present average prices of corn and pork any economical point in feeding becomes of great importance, for it is often the case that the margin for profit is entirely obliterated by a wasteful system in the use of the various kinds of food at the command of the feeder.

The Massachusetts Agricultural Experiment Station have, for some years past, been conducting a series of very careful experiments, conducted by J. B. Lindsey, who (see Bulletin No. 47 for May, 1893, page 2) thus sets forth the objects in view: "The results of our previous experiments have shown that the various grains such as corn meal, wheat bran, gluten meal and maize feed, when fed in connection with skim milk, have furnished very excellent and profitable rations for growing young pigs for the market.

The object of this experiment has been, among other things, to learn the value of gluten feed and corn meal when fed in connection with skim milk for the economical production of pork for the market.

Skim milk being a very nitrogeous article of food, with a nutritive ration of 1 to 2.15, the rations furnished the pigs were what might be termed narrow, varying from 1:3.3 to 1.5. Whether a narrow or a wide ration is better for growing and fattening pigs is still a matter of some dispute among investigators. It is certain, however, that the rations fed in our various experiments with pigs have been productive of most excellent results, and we commend them to the serious attention of the farmers of the state."

Six grade Chester White pigs were selected for the experiment which was divided into three periods, as follows:

1. Weight varying from 25 to 80 pounds each.
2. Weight varying from 80 to 125 pounds each.
3. Weight varying from 125 to 180 pounds each.

The kind and manner of food used during each period when reduced to tabulated form is as follows:

	Composition of ration.	Duration of period.	Nutritive ratio.
Period I.	2 oz. corn meal to each quart of milk.	20 lbs. to 80 lbs. live weight.	1:3.3
Period II.	4 oz. corn meal to each quart of milk, and 4 oz. gluten feed as a substitute for quart of milk.	80 lbs. to 125 lbs. live weight.	1:4.5
Period III.	4 to 6 quarts of milk and 14 parts corn meal to 1 part gluten feed to satisfy animal.	125 lbs. to 180 lbs. live weight.	1:4.9

In the second and third experiment, the pigs were treated in very much the same way except that they had larger rations of skim milk, which, at one time during the trial, reached ten quarts a day.

In all cases in which the supply of skim milk was limited, four ounces of gluten meal was substituted for each quart of milk, this being found to best bring the ration up to the desired proportions.

The character of the three periods and the manner of feeding during each, is thus given in tabulated form:

LOT I.

	Composition of ration.	Duration of period.	Nutritive ratio.
Period I,	2 oz. corn meal to each quart of milk.	27 lbs. to 75 lbs. live weight.	1:3
Period II,	4 oz. corn meal to each quart of milk, and 4 oz. gluten feed as a substitute for each qt. of milk.	75 lbs. to 120 lbs. live weight.	1:3.6
Period III,	6 oz. corn meal to each quart of milk, and 4 oz. gluten feed as a substitute for each qt. of milk.	120 lbs. to 175 lbs. live weight.	1:4.5

LOT II.

	Composition of ration.	Duration of period.	Nutritive ratio.
Period I,	6 oz. corn meal to each quart of milk.	27 lbs. to 80 lbs. live weight.	1:4.20
Period II,	4 quarts skim milk and 2 quarts water and corn meal <i>ad libitum</i> .	80 lbs. to 120 lbs. live weight.	1:5.3
Period III,	4 quarts skim milk and 2 quarts water and corn meal <i>ad libitum</i> .	125 lbs. to 180 lbs. live weight.	1:6.5

Mr. Lindsey thus summarizes the first experiment to which we have referred:

Average results of six pigs	
Live weight	182.8 pounds
Dressed weight,	144.9 pounds
Per cent. lost in dressing,	21.6 pounds
Live weight gained during experiment,	155.6 pounds
Dressed weight gained during experiment,	122.0 pounds
Dry matter required to produce 1 pound live weight,	2.27 pounds
Dry matter required to produce 1 pound dressed weight,	2.91 pounds

FINANCIAL STATEMENT.

732.15 pounds dressed pork actually produced during the experiment, at 71.4 cents per pound,	\$53 07
Cost of food required,	33 94
Profit from pork actually produced,	\$19 13
Value of manure produced,	9 61
Total profit from six pigs,	\$28 74
Total profit per pig,	4 79

If we take into consideration the first cost of the pigs and the dressed weight actually sold, we have the following:

867 1-4 pounds dressed weight actually sold at 7 1-4 cents,...	\$62 91
Total cost of food consumed,	\$35 19
Cost of pigs at \$3.00,	18 00
	<hr/> 53 19
Total profit from pork,	\$9 72
Value of manure produced,	10 00
	<hr/>
Total profit from six pigs,	\$19 72
Total profit per pig,	3 29
Cost of food to produce one pound of live weight,.....	3.64c
Cost of food to produce one pound dressed weight,	4.64c
Net cost of food to produce one pound dressed weight (ob- tained by deducting value of manure produced),.....	<hr/> 3.30c

Taking our data from the bulletin alluded to, the results of the second and third experiment may be thus summarized:

AVERAGE DAILY GAIN.

	First period— pounds.	Second period —pounds.	Third period— pounds.	Daily average of 126 days— pounds.
Lot I, .....	.84	1.33	1.50	1.22
Lot II. ....	.92	1.30	1.60	1.27

	Lot I.	Lot II.
	Average of three pigs.	Average of three pigs.
Live weight—pounds,.....	172.71	180.75
Dressed weight—pounds,.....	140.75	148.00
Per cent. of loss in dressing,.....	18.53	18.10
Live weight gained during experiment—pounds,.....	146.17	152.00
Dressed weight gained during experiment—pounds,....	119.16	122.47
Dry matter required to produce 1 lb. live weight—lbs.	2.82	2.57
Dry matter required to produce 1 lb. dressed w't.—lbs.	3.45	3.18

The financial side of the statement may be thus given:

	LOT I.	LOT II.
Dressed pork actually produced during experiment—lbs.	357.50	367.4
Value at 7¾ cents per lb. (market price),.....	\$27.71	\$28.47
Cost of food consumed,	19.95	18.02
Profit from pork actually produced,.....	\$7.76	\$10.45
Value of manure produced,.....	6.05	4.41
Total profit from three pigs,.....	\$13.81	\$14.86
Profit per pig,.....	4.60	4.95

In summarizing the experiments, it was assumed that 30 per cent. of the nitrogen, potash and phosphoric acid were taken into the system of the animal, and that nitrogen was fifteen cents; potash, four and one-half cents, and phosphoric acid five and one-half cents per pound; and the manure was given credit for these ingredients at these valuations.

The cost of the various articles of food was as follows: Corn meal, \$23.00 per ton; gluten meal, \$21.00 per ton; skim milk, 1.8 cents per gallon.

The bulletin gives the following as the results obtained by the experiments:

I. Skim milk, together with corn meal, gluten meal, wheat bran, gluten feed, maize feed, etc., combined as above stated, have proved healthy and profitable foods for the production of pork for our markets.

II. With skim milk reckoned at 1.8 cents per gallon, gluten feed from \$21.00 to \$23.00 per ton, and corn meal at \$23.00 to \$24.00 per ton, we have been enabled in these experiments to produce dressed pork at from 4.6 cents to 5.3 cents per pound. The net cost of the dressed pork produced (obtained by deducting the value of the manure produced), was from 3.3 and 3.8 cents per pound.

III. Farmers having a quantity of skim milk at their disposal, can utilize it profitably by feeding it to growing pigs, as above described. If this milk can be sold, however, at one cent per quart, or more, it would undoubtedly be more profitable to sell it than to use it in the production of pork.

IV. Experiments made at this Station have proved that it is not profitable to feed pigs after they reach a weight of 180 to 190 pounds, excepting, perhaps, when pork commands an exceptionally high price. Fed beyond this weight the food consumed increases and the percentage of gain in live weight steadily decreases, so that the daily cost of food consumed is more than the value of the daily increase in weight. This fact has since been confirmed by other stations.

J. S. Woodward, ex-secretary of the New York State Agricultural

Society, in reviewing the experiments of the Wisconsin Experiment Station, thus sums up the conclusions in relation to feeding for pork.

"The Professor (W. A. Henry), has demonstrated beyond a doubt, by a series of careful experiments, that the maintenance ration is in equal proportions to live weight, or nearly so, and that while a 100 pound pig requires one and one-half pounds (one pound of wheat middlings and two pounds of corn meal), simply to keep it without gain or loss, a 500 pound pig, under like circumstances, requires five pounds of the same food for its support. He further showed that about three pounds of this same food, in addition to either ration, made one pound of pork.

Now, were a man to try to make pork with these pigs, with the one he would get one pound for each four and one-half pounds fed; with the other he would feed eight pounds. For comparison, suppose the mixture worth \$20.00 per ton, or one cent per pound; in the case of the 100 pound pig, his pork would cost four and one-half cents per pound; in the case of the 500 pound pigs it would cost eight.

Or, to put it in another light, suppose ten pigs to be fed four and one-half pounds of feed each, or forty-five pounds in the aggregate, they would give a gain of ten pounds. In other words, with these pigs forty-five pounds of feed will give ten pounds of pork. Now, if the same feed be given to pigs weighing 500 pounds each, it will feed just nine of them five pounds each, but, as with pigs of this size it takes five pounds as the food support, no gain would be made. The food would be simply thrown away, so far as fattening purposes go.

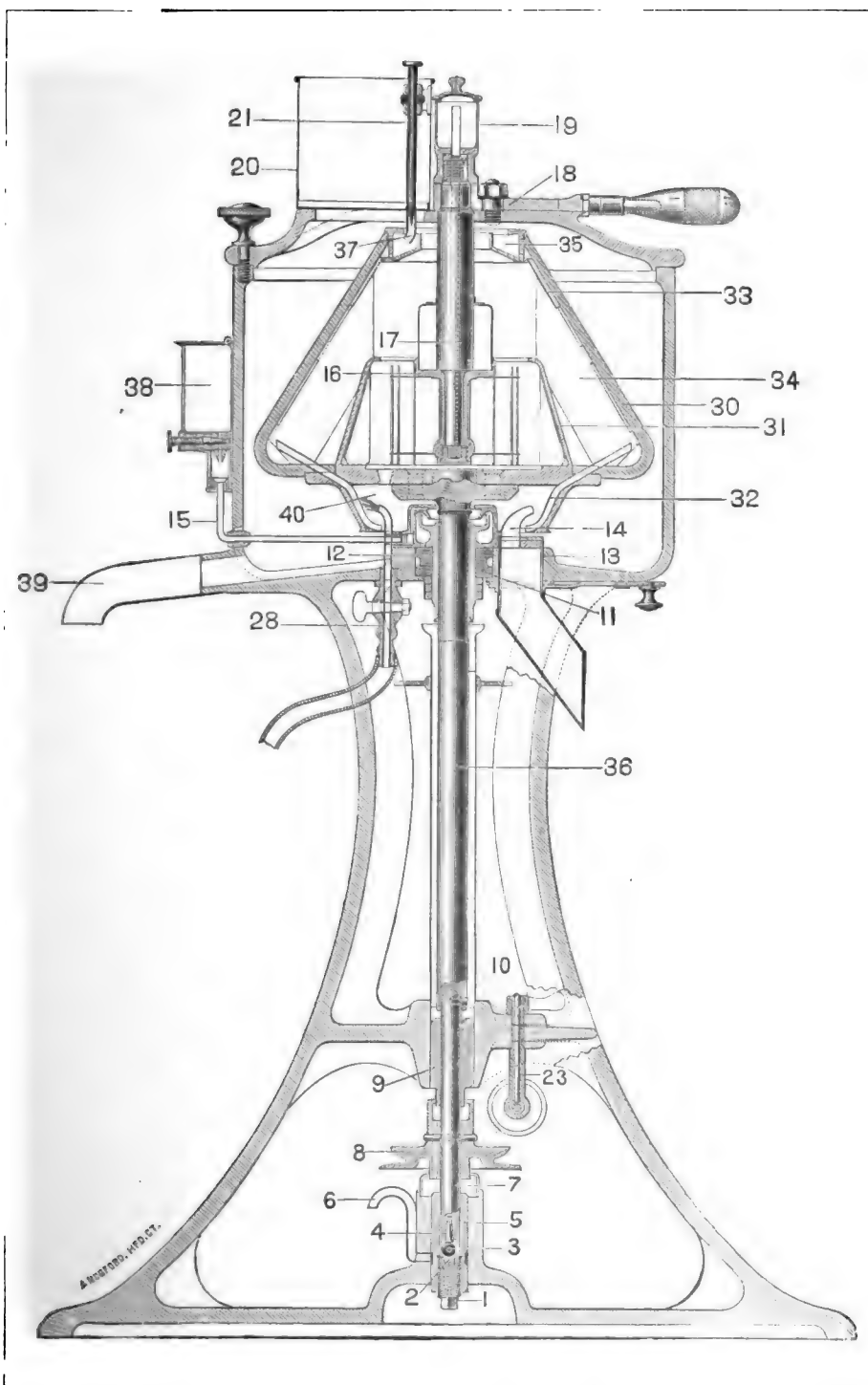
If these nine larger pigs be fed to make one pound of gain each, it would require twenty-seven pounds extra. This, added to the forty-five pound maintenance ration, makes seventy-two pounds of feed to make nine pounds of pork. It will be seen that these experiments of Prof. Henry show that the maintenance ration, while not exactly in proportion to the live weight, is approximately so. They show that while it took one and one-half pounds to support the growing 100 pound pig, that one pound per hundred pounds was sufficient with the 500 pound pig. This is easily accounted for by the fact that there is less proportionate amount of exterior surface in the larger pig, no growth, and probably less activity. But, carrying this proportion in the direction of a pig still smaller than 100 pounds, it would probably require, with a pig weighing twenty-five pounds, at the rate of two pounds per hundred pounds, or about one-half pound of food as a maintenance ration. If this be true, it would then only take three and one-half pounds with this pig to grow one pound of pork."

Cream Separator and Butter Extractor.

This comparatively new dairy implement, another form of which was illustrated on page 48 of our annual report for 1891, is so constructed that it may be used as an ordinary cream extractor and the butter afterwards taken out by the use of a churn, or by the manipulation of the different parts, may be used to separate the cream and take out the butter at one and the same operation. The main point of difference between it and the ordinary separator is in the use of the trundle wheel (16) running on a loose shaft (17) and so hung that

it may, by the use of a proper lever (18), be forced into or withdrawn from the wall of cream in the bowl; the fact that this wheel and spindle necessarily revolves at a lower speed than the bowl, breaks the envelopes of the butter globules and the released butter is collected in an appropriate chamber (40) from which it is removed into cold water ready for working and printing. The following description will enable the reader, if familiar with the working of an ordinary separator, to understand the manner in which the extractor operates:

1. A screw plug by means of which the height of the bowl is regulated.
2. A steel pin step on which the steel ball rests and revolves.
3. A steel ball on which the weight of both spindles and the bowl rests.
4. A steel pin in the lower end of the lower spindle, that rests on the ball.
5. The bush to the lower bearing for the lower spindle.
6. The oil tube where the waste oil is discharged. (Lower oil tube.)
7. The lower spindle.
8. The pulley through which the speed is transmitted to the bowl.
9. The bush to the upper bearing for the lower spindle.
10. A case around the upper spindle that carries the oil down to the lower bearings, and keeps milk, water and dust from them, with shield.
11. The rubber ring that steadies the bowl.
12. The neck bearing, complete 4 parts.
13. and 14. The butter knife and butter tube, through which the butter flows in granules, from the butter chamber.
15. The oil tube that conducts the oil from the cup on the side to all the bearings below.
16. The trundle wheel.
17. Trundle wheel spindle.
18. A lever that holds the trundle wheel and cream tube or knife. This lever moves the trundle wheel into or out of the wall of cream.
19. An oil cup that lubricates the trundle wheel.
20. The receiving regulator feed can.
21. The regulating pin that regulates the flow of milk from the pan into the machine.
23. The speed indicator, which may be applied any time while the machine is in motion.
28. Faucet and water tube to discharge a jet of cold water into the granulated butter in the butter chamber.
30. The large bowl.
31. The inner bowl.
32. The skim-milk pipe leading out of the bowl.
33. The new milk inlet tubes from the feeding rim.
34. A wing on the inside of the bowl to cause the milk to revolve with the bowl.
35. The new milk feeding rim.
36. The main spindle to the bowl.
37. Inlet tubes from the feed regulating can into the feeding rim.
38. The oil cup that supplies oil to all parts of the machine.
39. The skim-milk discharge from the machine.
40. The butter chamber from which the butter passes out of the machine in granules.



CREAM SEPARATOR AND BUTTER EXTRACTOR.

YIELD AND COST OF MILK.

BY THE SECRETARY.

Prof. H. H. Wing, of the Cornell Experiment Station, has instituted and carried on a series of experiments intended to show the yield of milk of the station herd, the character of food consumed, the amount consumed by each cow in proportion to her live weight and also in proportion to her yield of both milk and butter, and also to show, as demonstrated by the individual animals of the station herd, the comparative yields of the different breeds represented in the experiment.

As will be evident even to the casual observer, there are a number of surrounding circumstances which will more or less influence the results of such a test. It is not safe to measure the milk or butter yielding capacity of any breed by the performances of a few individual members of that breed, or even by the results in a few herds of any one breed. It is also evident that the individual characteristics of each animal enter largely into the results. The poorest cow we ever owned was a Jersey, and yet it would not do to condemn this breed because of the work of the one animal; and, on the other hand, it is not fair to any breed to give its record based upon the performances of a limited number of selected individuals, especially when the surroundings are such as would indicate that they are probably above the average of their breed, and that their treatment and feeding was above the average of the common dairies of our State.

In his experiment Prof. Wing has, in every possible manner, checked the possibilities of error, and we think that his results and conclusions may be accepted as a definite basis upon which our dairymen may figure the cost of milk and the effect of different kinds of food on milk and butter. It is also evident that Prof. Wing has gone at his work in a practical way, which must recommend the experiment and its results to the practical dairymen of his own and other states.

As showing the yield of milk and butter fat, the following table gives, in a condensed form, the yield of each cow in both milk and butter, and also the total yield of the whole herd, without reference to breed:

Cow.	AGE.		Milk--lbs.	Butter fat--pounds.
	Yrs.	Mo.		
Beauty,			8,028.50	391.62
Belva,	5	— 4	9,739.75	309.19
Bertha,	3	— 5	4,748.25	233.63
Carrie,	1	— 9	6,008.50	219.34
Cora,			6,214.50	326.68
Daisy,	1	— 10	2,829.75	159.02
Freddie,	6	— 4	11,165.00	417.97
Gazelle,	4	—	5,670.50	285.10
Gem Valentine,	3	—	3,387.75	197.33
Glista,	4	— 8	6,323.50	224.71
Glista 2d,	1	— 9	5,136.00	160.79
Jennie,	3	— 5	5,785.75	204.30
May,	10	— 4	5,458.50	195.31
Mollie,	2	— 4	7,757.25	260.34
Pearl,	3	— 4	9,003.25	299.07
Pet,	6	— 4	9,776.50	330.59
Puss,	7	— 3	10,417.00	302.93
Ruby,	3	— 4	7,955.00	282.35
Shadow,			8,655.50	382.77
Sue,			10,754.00	439.37
Total,			144,809.75	5,712.41
Average,			7,240.50	285.62

It will be noted that the production of each cow is stated in "butter fat, pounds," and not in butter, as ready for market. Assuming that average butter contains 20 per cent. of water, salt and other matter not butter fat, we may conclude that the average yield of the herd was equal to about 357 pounds per cow; but, it not being safe to assume that, in ordinary dairy practice, we can obtain all of the butter fat from the milk; assuming that one-half of one per cent. of the butter fat will be lost in the milk and butter milk, we have 332 pounds left as the average product per year of each cow.

From the table it appears that the best cow gave 439 pounds of butter fat which, upon the same basis as is used in the calculation above, is equal to nearly 550 pounds of marketable butter.

It will also be noted from the table that while, on an average, the largest yield of milk produced the largest yield of butter, yet the cow which gave the largest weight of milk (11,165 pounds) did not make the largest weight of butter fat, which is credited to a cow producing but 10,754 pounds of milk.

In this connection it may be interesting to note that the average live weight of the cows is 1,138 pounds and their average product of milk is 7,240.50 pounds, or at the rate of a trifle more than six and one-third the live weight of the average cow.

To show the actual cost of the milk and butter fat produced per cow, we present the following condensed table:

Cow.	Cost of food consumed during the year.	Pounds of milk produced.	Cost of 100 pounds of milk.	Pounds of fat produced.	Cost of one pound of fat.
Beanty,	\$44.24	8,028.50	\$0.55	391.62	\$0.115
Belva,	47.65	9,789.75	.49	309.19	.155
Bertha,	42.00	4,743.25	.89	233.63	.18
Carrie,	49.07	6,008.50	.82	219.34	.225
Cora,	38.74	6,214.50	.62	326.68	.12
Daisy,	41.24	2,829.75	1.48	159.02	.26
Freddie,	52.06	11,165.00	.47	417.97	.125
Gazelle,	39.96	5,670.50	.70	285.10	.14
Gem Valentine,	36.24	3,387.75	1.07	197.33	.185
Glista,	46.51	6,323.50	.74	224.71	.21
Glista 2d,	43.80	5,136.00	.85	160.79	.27
Jennie,	43.66	5,785.75	.75	294.30	.15
May,	44.34	5,458.50	.81	195.31	.225
Mollie,	45.98	7,757.25	.59	280.34	.175
Pearl,	47.44	9,003.25	.53	299.07	.16
Pet,	43.12	9,776.50	.44	330.59	.13
Puss,	47.87	10,417.00	.46	302.93	.16
Ruby,	48.63	7,965.00	.61	282.35	.17
Shadow,	53.38	8,655.50	.62	382.77	.14
Sue,	49.08	10,754.00	.46	439.37	.11
Total,	\$905.01	144,809.75		5,712.41	
Average,	\$45.25	7,240.50	\$0.625	285.62	\$0.158

From this table the following are, by calculation, obtained: average cost of food was \$45.25; the highest cost per cow was \$53.38, and the lowest was \$36.24; the average cost of the milk was 62 1-2 cents, the highest cost per 10 pounds being \$1.48, and the lowest 44 cents; putting the value of the milk at \$1.00 per 100 pounds at the barn, we find that all the cows but two are producing it at a profit, and, valuing the butter at 25 cents per pound (or the butter fat at 30 cents), all the cows were more than earning their keep in the butter product.

In order to test the effect of feeding grain in June and to ascertain whether it lessened the actual cost of the milk and butter fat, the following tables are given; the first shows the effect of grain upon the cost of the milk, and the second its effect upon the cost of the butter fat:

FED GRAIN IN JUNE.				FED NO GRAIN IN JUNE.			
Cow.	Cost of 100 pounds milk.		Reduction of cost in June. Per ct.	Cow.	Cost of 100 pounds of milk.		Reduction of cost in June. Per ct.
	May.	June.			May.	June.	
Beauty,	\$0.40	\$0.31	58	Belva,	\$0.48	\$0.17	182
Carrie, . . . . .	.75	.46	63	Bertha,	1.10	.38	180
Freddie, . . . . .	.48	.27	78	Cora, . . . . .	.52	.18	189
Gem Valentine, . . .	.80	.49	63	Daisy,	1.80	.59	205
Jennie, . . . . .	.62	.38	63	Gazelle, . . . . .	.62	.22	182
May, . . . . .	.77	.43	79	Glista, . . . . .	.68	.24	183
Mollie, . . . . .	.54	.36	50	Glista 2d, . . . . .	.75	.28	168
Puss, . . . . .	.40	.24	67	Pearl, . . . . .	.54	.24	125
Ruby, . . . . .	.55	.30	83	Pet, . . . . .	.33	.11	200
Shadow, . . . . .	.65	.39	67	Sue, . . . . .	.48	.16	200
Average,			67	Average,			182

FED GRAIN IN JUNE.				FED NO GRAIN IN JUNE.			
Cow.	Cost of 100 pounds of fat.		Reduction of cost in June. Per ct.	Cow.	Cost of 100 pounds of milk.		Reduction of cost in June. Per ct.
	May.	June.			May.	June.	
Beauty,	\$0.10	\$0.065	54	Belva,	\$0.155	\$0.06	158
Carrie, . . . . .	.195	.125	56	Bertha, . . . . .	.21	.075	180
Freddie, . . . . .	.12	.075	60	Cora, . . . . .	.095	.035	171
Gem Valentine, . . .	.14	.085	65	Daisy, . . . . .	.28	.10	180
Jennie, . . . . .	.125	.085	47	Gazelle, . . . . .	.115	.05	180
May, . . . . .	.23	.14	64	Glista, . . . . .	.185	.065	185
Mollie, . . . . .	.15	.09	67	Glista 2d, . . . . .	.24	.085	182
Puss, . . . . .	.155	.09	72	Pearl, . . . . .	.155	.065	188
Ruby, . . . . .	.165	.095	74	Pet, . . . . .	.10	.035	186
Shadow, . . . . .	.16	.105	62	Sue, . . . . .	.105	.045	183
Average,			62	Average,			164

In the experiment the cows were fed one-half of their usual winter ration of grain, or four pounds, and in commenting upon the comparative value of the grain and pasture, Prof. Wing writes thus: "It is interesting to note that the four pounds of grain ration per day cost just as much as the pasture at 30 cents per week; in other words, the addition of a grain ration doubled the cost of keeping the cows that month."

Taking this table as the basis of our calculation, we find that in May the average cost per 100 pounds of milk (with the first ten cows) was 60.5 cents; the same cows, with grain in June, gave milk at an

average cost of 36.3 cents per 100 pounds. It also appears from the second section of the first table that the ten cows whose record is there given, produced milk in May at a cost of 73 cents per 100 pounds, and with grain in June they produced it at a cost of 36.3 cents per 100 pounds. From this it is evident that the two lots of cows were not equally or fairly divided as to cost of their milk production.

A careful account having been kept of the dry matter consumed by the cows, Prof. Wing furnishes the data from which the following table is condensed:

Cow	Number of days.	Pounds of dry matter consumed.	Pounds of milk produced.	Pounds of dry matter consumed for each 100 pounds of milk.	Pounds of fat produced.	Pounds of dry matter consumed for each pound of fat.	Live weight—lbs.	Pounds of dry matter consumed per 1,000 pounds live weight per day.
Beauty,	152	3,754	4,728.00	79	235.55	17	858	28.8
Belva,	182	5,512	6,349.75	87	196.80	28	1,326	22.8
Bertha,	182	4,447	3,280.50	136	162.03	27	946	25.8
Carrie,	182	4,591	3,092.25	148	108.93	42	972	25.9
Cora,	90	2,319	2,528.50	92	133.95	17	1,123	22.9
Daisy,	182	4,337	1,741.25	249	97.63	44	815	29.2
Freddie,	182	5,723	7,068.50	81	260.14	22	1,474	21.3
Gazelle,	106	2,563	2,427.50	106	123.31	21	1,071	22.6
Gem Valentine, . . .	30	767	542.25	141	30.20	25	829	30.8
Glista,	182	4,784	3,903.25	123	134.13	36	1,270	20.7
Glista 2d,	152	3,825	2,736.00	140	82.13	47	1,001	25.1
Jennie,	105	2,481	1,813.75	137	96.79	26	1,030	22.9
May,	138	4,139	3,440.50	120	124.03	33	1,283	23.4
Mollie,	182	4,782	4,743.75	101	153.72	31	1,007	26.1
Pearl,	182	5,363	5,918.75	91	106.12	28	1,160	25.4
Pet,	91	2,636	2,795.00	94	95.71	25	1,305	22.2
Puss,	107	3,508	4,743.00	74	140.36	25	1,520	21.6
Ruby,	152	4,579	4,485.50	102	161.03	28	1,183	25.5
Shadow,	182	5,569	5,370.75	101	242.89	23	1,239	24.7
Sue,	182	4,900	5,983.75	83	266.23	19	1,040	26.4
Average,				101		27		24.7

In comparing the different breeds, Prof. Wing makes the following statement: "As between Jerseys and Holsteins, the Jerseys kept at a cost of about \$6.00 per year, or thirteen per cent. less; they gave a little more than five-eighths as much milk and almost as much fat as the Holsteins, and produced the fat at a cost of two cents per pound less, and the milk at twenty cents per hundred weight more, than the Holsteins. The two grade Shorthorns ate the most food, gave the most milk and fat, and produced milk and fat at the lowest cost; but, for reasons already shown, they cannot be considered as types of the common grades of cows of the country; they simply illus-

trate the fact that has often been noticed, that among such cows to be found here and there, individuals will respond to good care and improved feeding in the most remarkable way."

In order to give the reader an opportunity of comparing the relative merits of the different breeds, as shown by this experiment, but which cannot be accepted as a conclusive comparison, we give the following table from Prof. Wing's report:

	Cost of food consumed.	Pounds of milk given.	Pounds of fat produced.	Cost of 100 pounds of milk.	Cost of one pound of fat.
Two grade Short Horns.	\$51.23	9,705	411.07	\$0.53	\$0.125
Seven grade Jerseys.	40.87	5,237	260.67	.78	.15
Eleven grade Holsteins.	46.95	8,067	272.96	.58	.11
Average of all.	\$45.25	7,241	285.62	\$0.625	\$0.156

In closing his report of the results of the experiment, Prof. Wing feels warranted in drawing the following conclusions:

First. With a fairly good herd, carefully fed and kept, milk can be produced for sixty-five cents per hundred weight and fat for sixteen cents per pound for the cost of food consumed.

Second. That individuals of the same breed vary more widely in milk and butter production than do the breeds themselves.

Third. The larger animals consumed less pounds of dry matter per 1,000 pounds live weight per day than did the smaller animals.

Fourth. That in general, the best yields of fat were obtained from cows that gave at least a fairly large flow of milk, particularly as seen in the cows Sue, Freddie and Beauty.

Fifth. In general, the cows consuming the most food produced both milk and fat at the lowest rate.

Sixth. For the production of milk and fat there is no food so cheap as good pasture grass.

To these deductions we add the following:

1. It will be safer to estimate the cost of the average milk at 75 cents per 100 pounds and that of the average butter fat at 20 cents per pound.

2. That after all, the result is much more a question of individuals than of breeds, and that, taking all things into consideration, a herd of well selected grade cows (thoroughbred calves not entering into the account), will give the most profitable results.

3. This question, so far as the milkman or butter maker is concerned, is more a question of individual assimilation of food than one of size; we have owned small animals that consumed more dry food than larger ones and we have had animals which seemed to have (regardless of breed or size) the ability to convert more of their food into milk and butter fat, and to use less in adding flesh, fat or muscle.

4. This inference will hold good only as to the experiment to which it is applied; we think that the proportion of butter fat to milk is a question of individual cows, some yielding a much larger proportion than others, and that, in very many cases, a successful and profitable milk dairy is not always (necessarily) a profitable butter dairy.

5. Correct as applied to the experiment but not necessarily so in reference to the average dairy; some large eaters are poor producers of butter fat and some large milkers have the same peculiarity. The animal which can assimilate and use the largest proportion of its food will usually give the most profitable results, other things being equal.

6. Undoubtedly correct in this and other cases, but is it not possible that pasture may be profitably supplemented by grain and bran, and may it not be profitable to increase the number of cows kept and supplement the pasture by grain, bran or even hay?

Salting Butter.

At the annual meeting of the State Board, and at several of the Farmers' Institutes held by the Board, the question of the gain or loss of butter by salting has been brought up for discussion, and the statements of practical dairymen present made it evident that there was a wide difference of opinion in relation to the matter.

A search for practical facts in relation to the question demonstrated that very few experiments had been made to ascertain whether there was a gain or loss, and that less was known as to the percentage of this loss or gain and of the causes which affected it.

Major Campbell Brown, after a number of practical tests, draws the following conclusions:

"That if butter is worked unwashed, or washed in clean water, it will lose by salting and the loss will average from one-half ounce to one ounce per pound.

"That if it is washed in brine of moderate strength it will gain by salting, seldom, however, as much as a-half ounce to the pound.

"That if washed in very strong brine it will gain in weight about the weight of the added salt, but will contain quite too much salt to be first class table butter.

"That if butter is worked, washed and salted in the usual manner, then set aside for 12 to 24 hours and re-worked, there will be a slight loss."

The results of Major Brown's experiments may be thus tabulated:

	lbs. oz.
No. 1.—Unsalted, well-washed dry butter,	17 06
Salted and re-worked (on worker),	17 03
Loss in ounces,	03
No. 2.—Unsalted, well-washed soft butter,	28 03 1-2
Salted and re-worked (by hand),	29 04 1-2
Apparent gain,	1 01
No. 3.—Re-worked next morning,	26 08 1-2
Actual loss from unsalted,	1 11
Actual loss from salted,	2 12

There are, however, certain points of the question which must not be lost sight of in determining the weight of this or any other theory.

It is evident that we have in the salted mixture, a certain amount of butter, salt, water and buttermilk, and that if, by working, we remove a portion of the salt, water and buttermilk, the net weight of the remainder (the worked butter) will be reduced just in that proportion.

Under the usual process of salting and working, it is evident that a portion of the salt remains in the butter, but the inference is that, at least in some cases and under some methods of salting, the addition of salt liberates sufficient additional buttermilk and water to more than make up for the gain imparted by its actual weight.

Prof. Wing, of Cornell Experiment Station, in referring to the amount of water retained in butter, writes as follows:

"It is a pretty well established fact among butter makers that the amount of water which butter will hold depends upon the temperature at which the butter was washed and the fineness of the granulations. Butter that is finely granulated and washed at a rather cool temperature will hold a maximum amount of water, and such butter, when worked, will yield up more water if salt is added to it; that is to say, with finely granulated butter at a temperature of 36 to 40 degrees, it is impossible to work out as much water without salt as it is when salt is added, so that much butter, even when worked well, weighs more without the addition of the salt than with the salt. At higher temperatures there will not be so much difference, but nearly all butter will lose during the process of working, no matter how well drained it may be before being worked."

Realizing the uncertainty which appeared to follow the question, the writer suggested to Prof. H. J. Waters, of the State Experiment Station, that a series of experiments, made for the purpose of determining the question, would prove interesting and possibly give unexpected results; the matter was placed in the hands of W. S. Sweetser and R. J. Weld, of the State College Experiment Station force, and through their courtesy we are enabled to lay before our readers the conclusions and results arrived at by them.

In their report of the experiment Messrs. Sweetser and Weld write as follows:

"The question as to whether the addition of salt to butter before it is worked causes an increase in the weight of the worked butter, or whether, by the addition of salt, a sufficiently greater quantity of water is extracted from the butter in the process of working to compensate for the weight of the salt added, was submitted to a careful test with the following results: The butter used for the experiment was, in a majority of cases, made from gathered cream, but, in a few instances, was that produced from the milk of the Experiment Station herd. The amount of salt used varies from one-half ounce to one and one-half ounces per pound of butter. Plan of experiment:

The unworked butter, after having been thoroughly washed and allowed to drain, was taken from the churn, weighed and divided into equal lots for the various treatments, as shown in the table of results. One portion was salted at the rate of one ounce per pound, and worked to what we deem the proper degree for a high grade product.

It was re-weighed and the loss in working noted. The number of times it passed under the roller of the butter worker was also noted.

An equal quantity of butter from the same churning was salted at the rate of one and one-half ounces per pound, passed under the roller of the butter worker the same number of times, care being taken to have the pressure upon the butter the same, weighed, and the loss noted as per first lot. A third and equal lot of the same churning was worked the same as the preceding without being salted, weighed and the loss noted. By mistake in the case of the separator cream the rate of salting was one-half ounce instead of one and one-half ounces.

Samples of the butter thus treated were drawn for the determination of water, butter fat and salt by chemical analyses. This was repeated for three churnings, the amount of butter in each lot above referred to, varying from 13 to 24 pounds. Of the following, table No. 1 needs no explanation. Table No. 2 is computed on a basis of 100 pounds of butter fat. Table No. 3 gives the chemical analysis of the samples arranged according to the rate of salting.

Table No. 1 shows that in several cases the water and salt worked out of the salted lots exceeded the amount of salt added, yet the total weight of the worked butter was increased slightly more than 12 per cent. by the addition of from one-half to one and one-half ounces of salt per pound, as compared with similar butter equally worked without salting.

The amount of salt retained in the butter varies in this trial from 1.35 per cent. to 6.02 per cent. and seems to be dependent upon the amount of salt added, as table No. 3 clearly shows. The trials were not duplicated a sufficient number of times to give us any reliable data bearing upon the influence of temperature of churning or temperature of wash water used in washing the butter, upon the amount of salt and water retained in the finished butter.

In the case of the butter salted with brine, the butter fat contents averaged lower than that of butter salted in the ordinary way. This butter also contained a larger per cent. of curd than that from any of the other treatments and almost as much loss occurred in working as with the unsalted butter, the difference amounting to only about 0.03 per cent. The amount of salt retained by butter salted with brine was in one case slightly more than one-half-pound per hundred pounds butter, and in the other case, slightly less, although two ounces per pound of salt were dissolved in eight gallons of water per 100 pounds of butter.

From table No. 3 it will be seen that salting in the brine has about the same effect upon the chemical composition of the butter product as not salting at all, very little of the salt being retained. The percentage of curd is even higher than it is in the unsalted butter, while the water contained is nearly as high. Salting by this method seems to be labor and salt thrown away, and very likely the butter, especially if it should be kept any length of time."

TABLE No. 1.

KIND OF CREAM.	Sample.	Pounds of salt per									
		Ounces of salt per pound.	Pounds of butter used.	Pounds of butter and salt after working.	Pounds of salt retained.	Pounds of salt added.	Pounds of butter and salt before working.	Loss in wt. by working.	Pounds of fat in butter.	Pounds of water retained.	Pounds of salt retained.
Gathered cream.	A.	1.0	13	12.31	.54	.81	13.81	1.5	10.54	1.20	.54
"	B.	1.5	13	12.60	.76	1.19	14.19	1.5	10.95	1.22	.76
"	C.	Salting in brine.	13	11.50	.06			1.5	9.74	1.40	.06
Separator cream.	D.	1.0	13	11.25	.65	1.5	13.00	1.75	9.44	1.40	.65
"	E.	1.0	24	23.00	.31	1.5	25.50	2.5	20.00	2.17	.31
"	F.	0.5	24	23.25	.31	1.75	24.73	1.5	20.13	2.57	.44
Gathered cream.	G.	1.0	24	21.50	.88		24.00	2.5	18.32	2.06	.88
"	H.	1.0	14	13.38	.30	.88	14.88	1.5	11.53	1.37	.30
"	I.	1.5	14	13.31	.84	1.31	15.31		12.83	1.48	.84
"	J.	Salting in brine.	14	12.50	.06			1.5	10.36	1.50	.06
"	K.		14	12.50			14.00	1.5	10.78	1.61	

TABLE No. 2.

KIND OF CREAM.	Sample.	Ounces of salt per pound.	Pounds of granulated butter used.	Pounds of salt added.	Pounds of butter and salt before working.	Pounds of butter worked.	THE BUTTER CONTAINED.				
							Pounds of butter fat.	Pounds of water.	Pounds of salt.	Pounds of curd, by difference.	
Gathered cream.	A.	1.0	123.21	7.67	130.89	116.67	100	11.37	5.11	.19	
"	B.	1.5	122.05	11.17	133.22	119.14	100	11.45	7.31	.89	
"	C.	Salting in brine.	133.45			118.05	100	11.37	.61	3.07	
"	D.	1.0	137.70		137.70		100	15.78		3.39	
Separator cream.	E.	1.0	120.00	7.50	127.50	115.00	100	10.85	3.25	.90	
"	F.	0.5	119.20	3.72	122.92	115.48	100	12.76	1.53	1.19	
"	G.		113.80		130.30	117.34	100	16.14		1.20	
Gathered cream.	H.	1.0	121.42	7.63	129.05	116.04	100	11.88	3.38	.78	
"	I.	1.5	109.11	10.21	119.32	119.32	100	11.53	6.54	1.25	
"	J.	Salting in brine.	135.12			120.64	100	14.47	.57	5.00	
"	K.		120.86		129.96	115.96	100	14.83		1.12	

TABLE NO. 3.

Sample.	Ounces of salt per pound.	Per cent., water.	Mean.	Per cent., fat.	Mean.	Per cent., salt.	Mean.	Per cent., curd by difference.	Mean.
B. . . .	1.5	9.65	9.68	84.00	83.91	6.02	5.76	.38	.65
I. . . .	1.5	9.71		83.81		5.51		.97	
A. . . .	1.0	9.80	9.84	85.63	85.27	3.47	2.99	1.10	1.90
E. . . .	1.0	9.44		86.96		2.84		.76	
H. . . .	1.0	10.29		86.21		2.65		.85	
F. . . .	0.5	11.07	11.07	86.59	86.59	1.35	1.35	.99	.99
D. . . .	Salted in brine.	12.18	12.09	84.75	83.82	.54	.51	2.53	3.58
J. . . .		12.00		82.88		.49		4.63	
C. . . .	.....	13.26	13.31	83.94	85.15	.....	.....	2.80	1.54
G. . . .	.....	13.78		85.22		.....		1.00	
K. . . .	.....	12.90		86.28		.....		.82	

Edam and Gouda Cheese.

Governor Flower, of New York, in his annual message, used the following language, "Why should farmers cater to English tastes by exporting cheese at 8 cents per pound when there is an abundant home market for fancy cheeses bringing many times the price," and furnished Dr. Collier, of the Geneva Experiment Station, with a basis for valuable experiments in the manufacture of Edam and Gouda cheese, now so popular in our stores.

The Edam cheese is made from partially skimmed milk, which should contain not less than three-fourths to two-thirds of its original butter fats; the milk must be perfectly free from anything that will in any way injure or taint the product, and the greatest care must be exercised throughout the whole operation, from feeding the cows to marketing the cheese.

As they come to our market, the Edam cheese are about three and one-half pounds in weight, but this is merely the result of custom, and, after once introduced, there is no doubt but that other weights would find just as ready sale. In North Holland, and especially in the town of Edam, from which they take their name, an exact weight is carefully arranged for, and the practiced eye of the cheese maker will at once detect any great variation, and the buyer will at once reject any cheese below or above the regulation size.

The milk is slowly and carefully brought up to a temperature of not more than 88 degrees F., and after it has been retained at that point long enough for the temperature to be well established, the coloring matter is added. Dr. Collier, in his experiments, used from one and one-half to two ounces of Carter cheese color to each 1,000 pounds of milk and was very careful to add it slowly and before any coagulation had taken place.

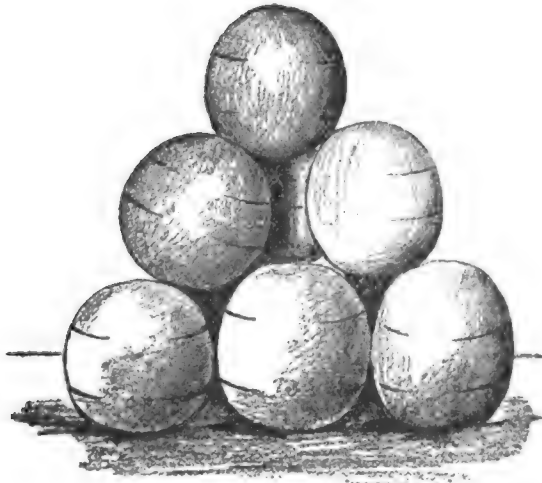
After the coloring matter has been well incorporated, sufficient rennet is added to produce complete coagulation in about 15 minutes; in his experiments, Dr. Collier used Hansen's rennet extract at the rate of five ounces to each 1,000 pounds of the milk. It is important that in the addition of the coagulating material there should be no guess work, and that everything should be weighed or measured carefully and exactly.

If the proper amount of rennet has been added, and if the proper temperature has been preserved, the curd should be ready for cutting in 15 minutes after the rennet has been put in, but this proper condition can only be known from practice, for the point will vary more or less with the richness of the milk and the season of the year.

For cutting the curd, two classes of knives are used; on cutting vertically and the other horizontally. The first cutting is done vertically and the curd allowed to stand until the whey shows signs of separating, when it is cut crosswise; the cross cutting is immediately followed by the horizontal knife and the curd thus divided into cubical blocks of small size.

As soon as the operation of cutting is completed, the curd is as rapidly as possible, heated up to 95 degrees F. and kept constantly agitated to prevent over-heating in any part. As soon as there are signs of hardening, the whey is drawn off; this point cannot be indicated by any rule, but can only be ascertained after practical experience and careful watching.

As soon as sufficient curd is freed from the whey, the filling of the moulds at once commences and the utmost care must be exercised to prevent the temperature of the curd from falling below 88 to 90 degrees F. The curd in the vat must be kept covered and every possible precaution taken to keep it warm during the filling process.



EDAM CHEESE—Weight $3\frac{1}{2}$ pounds.



Mould and Cover for Edam Cheese.

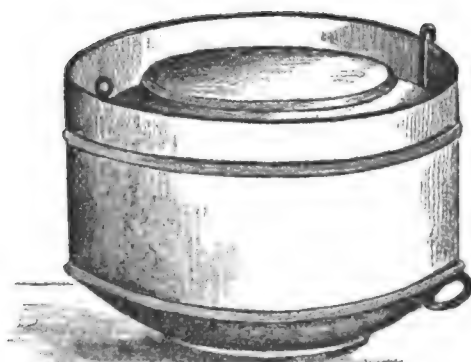
In filling the moulds the curd is taken from the vat, the adhering whey pressed out as much as possible by hand pressure, and the ball must be carefully broken up before it is pressed into the mould. The moulds if of proper size, will hold about five pounds of the curd, and, as soon as filled, are put under a steady pressure of 20 to 25 pounds, where they remain for a half hour.

Sweet whey, heated to a temperature of 125 degrees, is kept in a convenient vessel and as the cheese is taken from the mould, it is immersed in the hot whey for two or three minutes and is then ready for the "dressing," which is composed of strips of cheese cloth long enough to go around the cheese and lap over an inch or more. This bandage is carefully moulded over the whole cheese except a small spot at each end, over which small pieces of similar cloth are afterwards placed. While these strips are being put on, the cheese is kept moist and warm by immersion in the warm whey, and when properly bandaged it is ready to go into the mould, where it is kept under a pressure of 100 pounds for from 8 to 14 hours.

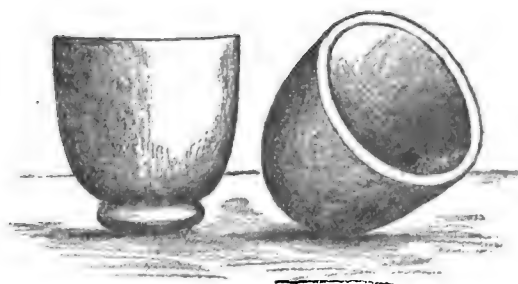
Two methods of salting are practiced in Holland, each of which has its admirers and for each of which special advantages are claimed. When dry salting is adopted, the cheese, when taken from the mould, is taken from its bandages and placed in a special mould known as the salting mould; each mould is carefully sprinkled inside with dry salt and is somewhat larger than the original mould so as to admit of a thin layer of salt all around the cheese. Each cheese is salted in this way daily for from 5 to 7 days, according to the time of year and saltiness required by the market. Care is taken to replace it each time in the mold in a position different from that formerly occupied, and it soon permanently takes the form in which it reaches the market.

When wet salting is resorted to, a brine is made by dissolving one pound of salt in two and one-half quarts of water. Each cheese is immersed in this brine for from 6 to 9 days and carefully turned each day.

In either case, whether dry or wet salted, the cheese is carefully wiped with a dry towel each day and all greasy matter carefully removed from its outer surface. It is placed on the shelf in the curing room and is turned over and rubbed with the bare hand each day for one month; during the second month they are rubbed and turned twice each week, and after that but once each week, until thoroughly cured. During the drying process, care is taken to give the cheese the flattened appearance which they bear when they arrive in the market, and without which their value would be lessened in obedience to the whims of fashion and habit.



Moulds for Gouda Cheese, united.



Salting Mould for Edam Cheese.

When the cheese are thoroughly cured, which is after two months' stay in the curing room, they are carefully smoothed off in a lathe made for the purpose, and their surfaces colored to the carmine color by which they are distinguished in our markets. When ready for marketing, each cheese is carefully bandaged in tin foil, and they are packed in boxes containing 12 cheese arranged in two layers of six each.

In the cheese district of Holland, much value is given to having the curing rooms in just the proper condition as to temperature and moisture, and in the most noted Edam districts, the moisture is carefully regulated by a hydrometer. For the proper curing of Edam cheese the atmosphere of the room should be but little above the point of saturation and should contain not less than 85 per cent. of moisture, and the temperature should not go below 85 nor above 95 degrees.

The Gouda cheese is made from perfectly sweet, whole milk, which is treated very much in the same manner given for the manufacture of the Edam cheese. When the temperature is about 90 degrees, the rennet extract is added in about the same proportions as has been directed for the Edam cheese. The curd, when cut, should be in pieces about the size of kernels of wheat, and when ready for the moulds should be "rubber-like in feeling and make a squeaking sound when chewed."

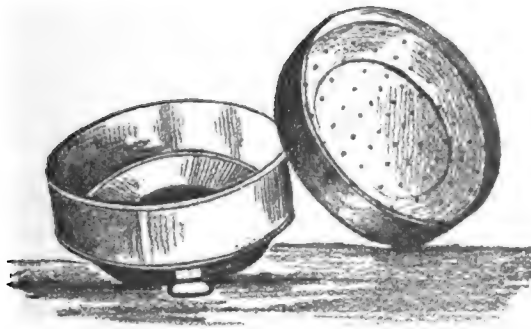
When the whey has been run off the curd should be kept as near 100 degrees as possible and the same precautions taken to prevent its being chilled as were given in the preparation of the Edam cheese. Each cheese is submitted to a pressure equal to fifteen times its own weight for half an hour. The first bandage is then placed on it and it is replaced in the mould for an hour; after this it is removed, the first bandage is taken off and another put on, taking care to place a small piece of cloth over each centre of the cheese, which is then placed in the press for 10 to 12 hours more.

When taken from the press the bandages are removed and each cheese rubbed carefully with fine salt until the salt begins to dissolve; this treatment is continued twice each day for 10 to 12 days, according to the time of year. They are then dipped in warm water, dried and rubbed until in the proper condition for market.

The mould for the Edam cheese is of carefully turned out, clear, white wood, special care being taken to select wood which will not taint. The lower or main part of the mould has several holes through which the whey flows, and the upper or smaller portion merely serves as a cover or top. The exact shape and size of these moulds vary with the district in which they are used, but they may be roughly stated as being six inches wide and the same in depth.



Gouda Cheese.



Mould for Gouda Cheese.

The moulds for the Gouda cheese are also in two parts, but are made of heavy pressed tin and have an inside diameter of about ten inches by about 5 1-2 inches in depth, with the upper portion sliding down on or into the lower so as to decrease the total height at will.

The experiments at the Station have enabled Dr. Collier to formulate the following table showing various items of interest in the manufacture of the Gouda cheese:

TABLE SHOWING AMOUNT OF FAT LOST AND RECOVERED IN THE MANUFACTURE OF GOUDA CHEESE.

No. of experiment.	Pounds of fat in 100 pounds of milk.	Pounds of fat lost in whey for 100 pounds of milk.	Pounds of fat recovered in cheese for 100 pounds of milk.	Per cent. of fat in milk lost in whey.	Per cent. of fat in milk recovered in cheese.
151	3.75	0.29	3.46	7.73	92.27
148	4.15	0.34	3.81	8.20	91.80
149	4.45	0.43	4.02	9.66	90.34
150	4.50	0.35	4.15	7.88	92.12

Dr. Collier, in his report (Bulletin No. 56, for May, 1893), makes the following statements in relation to the manufacture of Gouda cheese:

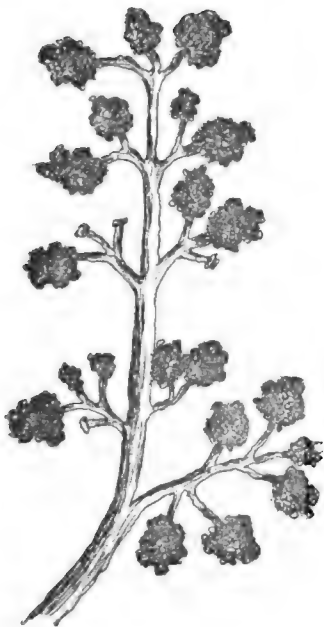
From one hundred pounds of milk, there were made from 11.60 to 13.35 lbs. of green cheese, with an average of 12.50 lbs. This was equivalent to nearly three pounds of green cheese for one pound of fat in milk. This large yield is due to retention of moisture, which varied from 4.95 to 5.79 lbs. and averaged 5.40 lbs. for the cheese made from one hundred pounds of milk. The amount of water in 100 lbs. of cheese varied from 41.25 to 45.43 lbs. and averaged 43.50 lbs. In two months the cheese had lost about 17.5 per cent. of their weight in curing.

The amount of fat in one hundred pounds of milk varied from 3.75 to 4.50 lbs. and averaged 4.21 lbs. Of this amount of fat, there were lost in the whey from 0.29 to 0.43 lbs., with an average of 0.35 lbs. This was equivalent to from 7.73 to 9.66 per cent. of the fat in the milk, with an average of 8.30 per cent. The loss of fat appears to be not much greater than the average loss met with in cheese factories in making Cheddar cheese. A little larger loss would be expected from the higher temperature used in heating the curd.

Spraying for Black Rot in Grapes.

The practical experience of each season more clearly proves that the black rot and anthracnose in grapes may be controlled and prevented by spraying with properly compounded materials. The experience of Gabriel Hiester, member of the Board from Dauphin county, as state on page 262 of the annual report of 1892, has caused considerable inquiry at the office of the Board, and we can only reply that the practical experience of all fully corroborates the experience of Mr. Hiester.

Mr. Hiester thus gives his experience for 1892: "For the past five years my grape crop has been growing less each year. The black rot, anthracnose, and all the mildews known, settling on them and thinning them out until last year (1891), with a full crop set on every vine, and with the best care (spraying excepted), the crop from one thousand one hundred vines was one and one-half tons of second class grapes. I am sure there was not one half ton of perfect clusters. This year (1892), with the same care and spraying added, the yield was nine and one-half tons, of which six tons were strictly first class in every respect; large perfect clusters with a fine bloom, something I have not seen for four years past."



Natural Size.

The application used by Mr. Hiester was composed of six pounds of sulphate of copper, four and one-half pounds of lime and fifty gallons of water. The amount required for 1,100 vines was two and one-half barrels, and it was applied in one and one-half days with a knapsack sprayer.

The Delaware Experiment Station (see bulletin No. XV, for January, 1892,) gives the following as the result of spraying for black rot in the vineyards of Levi E. Anthony, near Smyrna, Delaware.

In 1888 the vineyard of 1,200 vines gave less than 250 pounds of sound fruit, the loss from black rot being fully 98 per cent. of the crop; in 1889, which was an unfavorable season, the vineyard yielded 2,953 pounds of sound fruit, after a spraying with Bordeaux mixture; in 1890 the vineyard was partially treated by spraying, and as a result it was found that 879 sprayed vines yielded 7,451 pounds of excellent fruit; in 1891 the product, after spraying, was 16,000 pounds from 1,200 vines treated.

The result of the experiments in Mr. Anthony's vineyard may be thus tabulated:

Number of vines sprayed 5 times during season.		Total cost of materials and labor.	
1889,	1,088		\$36.10
1890,	879		17.10
1891,	1,200		23.95
Total,	3,167		\$77.15

From this it appears that the cost per vine per season of the five applications, material and labor both being counted, was two and seventy-seven hundredths (2.77) cents per vine and that the amount of the spraying materials used per vine was about one-fourth of a gallon.

In summarizing the result of these and other experiments, Prof. Chester uses the following language:

"The experiment, as a whole, teaches that however seriously a vineyard may be infested by fungous diseases, such a vineyard can, by persistent application of the Bordeaux mixture, be brought to a healthy condition and into normal bearing. Hence, if any farmer suffers from mildew, rot, anthracnose, etc., it is because of neglect, indifference or ignorance of what experimentors the world over have repeatedly demonstrated."

Prof. Chester recommends the following mixtures:

1. Copper Carbonate in suspension—Copper carbonate, 1 pound; water, 25 gallons.
2. Copper Soda Hyposulphite—Copper sulphate, 8 ounces; soda hyposulphite, 14 ounces; water, 25 gallons.
3. Johnson's mixture—Copper sulphate, 8 ounces; ammonium carbonate, 1 pound; water, 25 gallons.
4. Copper and Ammonium Carbonate mixture—Copper carbonate, 8 ounces; ammonium carbonate, 1 pound; water, 25 gallons.

In Delaware experiments with these mixtures, the applications were made May 13, June 6, June 24, July 10 and July 29.

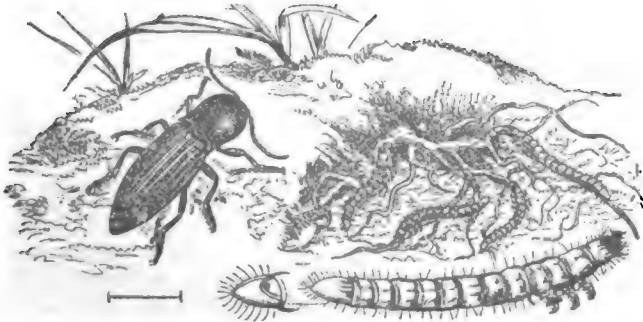
Applications of each of the above mixtures, made on the dates named, gave the following proportions of decayed fruit: No. 1, 1.35 per cent.; No. 2, 1.2 per cent.; No. 3, 1.57 per cent., and No. 4, 1.96 per cent., and the average loss in that portion of the vineyard which was not treated was over 40 per cent.

The Station recommends the following treatment for vineyards:

- "1. Spray the vines before the buds swell with a solution of copper sulphate (blue stone), one pound to 25 gallons of water.
2. Spray the vines with the Bordeaux mixture. Make the first application by the close of the first week in May; then every two weeks until four applications have been made.
3. Two weeks later spray the vines with the ammoniacal copper solution."

INSECT ENEMIES.

WIRE WORMS.



Snapping Beetle, Wire-worm and Larva.

are that, especially in the southeastern part of the State, this pest has

During the past season we have received numerous complaints of injury to corn and to permanent pasture from what are known as wireworms, and the indications

either been unusually plentiful in corn fields or that, upon account of wet and cool weather, the young corn plants have not been as able to withstand its attacks.

Nearly every year we are called upon to chronicle the appearance of some species of insect in unusual numbers; one year we have the wheat midge in such numbers as to greatly injure the crop and the next season its ravages are not noted; some seasons the potato beetle is unusually destructive and the next season but few are reported; certain seasons we have damages from the oat midge, which usually almost disappears by the time the next crop is in condition to be injured.

It appears to be a beneficent law of nature that all insect pests are held in check by certain parasitic or destructive enemies, and that in the ordinary course of nature these enemies are able to hold its proper prey in check, but occasionally, either from the absence of its enemies or a season accompanied by surroundings unusually favorable to the production of the pest, it appears in great numbers. Within a short time its enemies assert their sway and it disappears much more rapidly than it came, and it is probable that the unusual number of wire worms and corn-bill bugs which were this year reported in South-eastern Pennsylvania, may have been due to one or both of these causes.

The wire worm is the larval condition of one or more species of the "click-beetle," so well known to every farmers' boy, who so often lays it on its back in order to see it turn over to its normal position by snapping its head and body, so as to not only turn it entirely over, but at the same time throw it to a considerable distance in the air. The insect being unable to turn over on account of the shortness of its legs and the hardness of its body, is by nature provided with this means of assuming its proper position.

These beetles hibernate in the soil and appear to prefer an old sod. The eggs, according to our best authorities, are laid in the spring or early summer, but their history from the full grown beetle to the partially formed wire worm is not well understood and authorities differ materially.

The length of time in which the insect remains in the wire worm stage is uncertain; some of our best authorities give this period at three years, others at a still longer period, while some claim a duration of two years and in some cases of but one year. It is probable that much of this difference of opinion is due to the fact that in different sections of our country at least five distinct beetles produce larva which are known as "wire worms."

Early in November, if the larval period has not been completed, the wire worm ceases to eat and hibernates until the next spring. When the proper time for the change into the pupa comes, the worm forms for itself an earthen chamber in which it soon emerges in the pupal form and has taken on much of the form of the parent beetle. With at least one of the species, this period commences about July 1, and it is probable that the change takes place within a few days after the earthen cell has been constructed.

The immature beetle remains in its earthen home until the early part of spring, when it comes forth probably ready to propagate its species by another round in the same manner.

Various remedies have been tried, but thus far none of them appear to accomplish the desired purpose with any certainty. The application of various poisonous compounds have been recommended, but from the fact that anything which will seriously injure the worms will also kill vegetation, none of them have been successful. Probably fall plowing, by killing or destroying the immature beetles and the hibernating worms, is as efficient as any plan that can be recommended. Experiments made at Cornell University Experiment Station indicate that no relief need be expected from any application to the soil, and they also prove that any great disturbance of the beetles usually produces death.

CLOVER LEAF BEETLE—*Phytonomus Punctatus*.

A correspondent in Lehigh county forwarded specimens of the larva of this insect and reports damage to the clover crop in several sections of the county, especially where the growth was heavy and the ground moist.

In the annual report of the Board for the year 1884, page 216, Prof. Buckhout, Entomologist of the Board, thus describes the insect:

While feeding, the body is somewhat curved, and the larvae evidently hold to the hairs of the leaf by the folds between the joints of the body, as they are entirely legless. As they increase in size they acquire a greenish tinge, the broad dorsal stripe alone remaining whitish. A few of them, however, retain the pale yellowish color throughout their development. After the third molt they feed at the sides of the leaf, eating out large irregular patches, as shown in the figure. Only the very young larvae can be observed upon the plants, the older ones invariably dropping to the ground when approached. Most of the larvae, however, do not feed upon the plants during the daytime, but are to be found under all sorts of shelter in or on the ground, sometimes quite a distance from the plant, but preferably among the roots and old stalks. Here they lie curled up in a similar manner to our saw-fly larvae or cut-worms. When handled they often eject in a long stream their semi-fluid, pitchy black excrement, probably as a means of defense. When teased, they finally stretch out and walk off more rapidly than could be expected of a legless curculionid larva. The anus evidently plays an important part in locomotion; it is somewhat extensile, and each time the larva uses it to take hold of the leaf a small drop of sticky fluid is ejected. The anus also seems to possess the power of suction, as the larvae are capable of erecting themselves so as to look around for some object to take hold of, turning, at the same time, their bodies in all directions, and holding solely by the anal end. Toward evening they begin to be more active and ascend the plant, undoubtedly continuing to feed throughout the night. However, even at dusk they do not become less timid than at daytime, and can only be observed upon the plants at a considerable distance, curling up and dropping down when approached. Their favorite position is with their bodies around the edge of a leaf, but more rarely one may be seen stretched out on the surface of a leaf.

The damage done by the larvae in the month of June was already quite considerable, the presence of four or five half-grown ones being

sufficient to give the plants a ragged appearance, and in some places where the plants were completely defoliated, not less than thirty-two larvae were counted under one plant, which was not a very large one.

After feeding for from ten to fifteen days, having suffered three molts, the larva commences to spin its cocoon. The cocoon is oval, pale yellow in color, and is composed of coarse threads forming an irregular network. Usually they were just covered with the soil, but in some instances they were more than half an inch in the ground, each cocoon lying in a nicely-smoothed cavity. The spinning of the cocoon lasts for about one day, when the larva ceases to work and remains lying in a more or less curved position until it finally casts its skin to transform to a pupa.

The principal damage is done by the insect after it arrives at the perfect or beetle state. The beetle is very voracious, and devours the leaves at a very rapid rate, eating the flower heads and stalks, and also the leaf petioles—in fact all parts of the plant above ground. It feeds, principally, late in the afternoon and late at night, and during the daytime generally hides itself around the roots of the plant or in some crack in the ground. It is easily disturbed when feeding, drawing up its legs, dropping to the ground and remaining motionless for some time.

It is still uncertain whether more than one generation is produced in a single season or not, but it is considered highly probable that the insect may be double-brooded, at least in favorable years. The larvae were found at all times, though the most abundant in May.

So far, but few enemies of this insect have been observed, though it is said that in Europe parasites are so abundant that the clover beetles are held completely in check. It is altogether probable that the numerous tiger beetle larvae feed largely upon them. No feasible method of extermination seems at hand. Plowing under the clover would do some good if done when the majority of insects were in the larva state, namely, in May.

CLOVER ROOT BORER—*Hylesinus Trifolii*.

Specimens of this enemy to the common red clover were sent for description and name by a Lancaster county correspondent, who reported it as having committed ravages to a limited extent in several clover fields of his neighborhood.

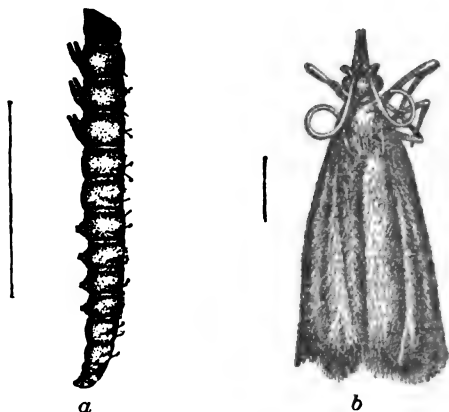
Prof. Riley thus describes the insect: "The insect hibernates in any of the three stages—larva, pupa and adult—and as soon as the spring opens the beetles issue from the ground and pair. The female instinctively bores into the crown of the clover root, eating a pretty large cavity, wherein she deposits from four to six pale, whitish elliptical eggs. The older plants and those which have been injured or have begun to decay seem to be most frequently chosen. The eggs hatch in about a week, and the young larva at first feed in the cavity of the plant made by the parent. After a few days, however, they begin to burrow downward, extending to the different branches of the root. The galleries made by burrowing run regularly along the axis of the roots and are filled with brown excrement.

The pupa is formed in a smooth cavity, generally at the end of one of these burrows, and can be seen in small numbers as early as Sep-

tember. After such injury the clover is unable to produce new roots and soon dies. It is to be hoped that this destructive pest will meet with some enemies which will at least hold it in check, since no mode of prevention is suggested except plowing under the clover when the presence of beetles is observed. If there are other plants which can serve it as food it is evident that plowing under would be of little avail."

Mrs. Treat (Injurious Insects, page 137,) writes, "I examined the clover in some half dozen fields during a ride of ten miles (in New York) and found every plant I pulled up was more or less injured. While most of the plants are yet alive, they are of little value for hay, seed or pasture. The only remedy thus far suggested is to plow all the clover found to be infested in the spring of the second year. Some parasites are known to prey on this insect, which may diminish it."

THE WEB WORM—*Crambus Caloginosellus*.



CORN CRAMBUS—*Crambus Caloginosellus*—a, Larva, b, Imago.

The past season has been replete with complaints from the southeastern part of Lancaster county, the southwestern parts of Chester, and the southern part of Schuylkill, of damage done the corn crop by the "web worm," and specimens sent to the Department could not be verified for the want of proper descriptions in standard works upon entomology.

The injury done did not appear to be from eating into the body of the young plant and destroying its substance, but by girdling the plant just below the surface of the soil.

Some plants sent us were completely encircled by wounds inflicted by the web worm; others were only partially girdled, but all the specimens were more or less injured and those not positively killed had their growth retarded and made spindling plants incapable of producing good ears.

The manner in which the insect works upon the growing corn renders remedies very difficult of application, as any application which will injure the worm will, at the same time, kill or injure the crop.

It has been stated that a firm pressure of the foot around the hills will close up the silken galleries which the worm builds just under the surface of the soil and that they may thus be killed.

Prof. Beckwith, of the Delaware College Experiment Station, in bulletin No. XIV for December, 1891, thus describes this species of web worm; our illustrations are also taken from his report.

"The moth, or perfect insect, averages one-half an inch in length and measures about one inch across its expanded wings. The body is slender; its front wings are of an ashy-gray color, marked with

rows of brownish scales between the veins and two transverse rows of brownish scales on the outer portion of the wing, the other third of which is also of a darker color than the remainder of the wing. The fringe of the wing is of the same ash-gray color as the wing itself, and there is a row of black scales along the apical margin of the wing. The hind wings are a darker color than the front wings. The thorax, abdomen and legs are the same color as the wings. Two long scaly palpi project from the front of the head like a proboscis or beak.

A peculiarity of this insect that is very noticeable is that, when at rest, the wings and body are elevated at an angle with the substance on which it rests.

The larva or caterpillar which causes the injury to plants is about one inch in length when fully grown, of a slender cylindrical form, and of a pinkish white color, slightly tinged with brown. The head is dark brown or black. There are several stiff bristles or hairs upon each segment."

THE BUD MOTH—*Timetocera Ocellana*.

This foreign pest, which appears to have been noted in Europe as early as 1800, obtained a lodgement in this country about the year 1840, and is first described by Harris one year later. In 1869, Dr. Packard, of the Massachusetts Board of Agriculture, records its damages in that State, and in the report of the Board for that year pronounces it "the most injurious enemy of the apple tree, next to the Canker worm, that we have in this State." The first record of its attacks upon the apple trees of our own State appears in the year 1870.

As is implied by its common name, it attacks the buds of apple trees into which it works its way, and, by taking for its sustenance the juices which should nourish the bud, either kills or so deforms its growth as to prevent the production of a symmetrical twig, and thus soon deforms the whole tree. In many cases it bores into the centre of the wood of the young stem, but mostly confines its attentions to the terminal and most vigorous buds. In some instances it effects an entrance near the base of the bud and works its way down the centre of the stem for several inches below the bud, and, in such cases, usually kills the twig as far as the burrow extends downward.

Dr. Comstock, Entomologist of the National Department of Agriculture in 1879, thus describes the work of this insect: "The larva settles in one of the more advanced leaves, of which it cuts the petiole half through, either near its base or close to the leaf, so that it wilts. Of this half-dead leaf it forms a sort of tube by rolling the edges of one side more or less down and fastening it with silken threads and then lining the inside sparsely with silk. If the leaf which it has selected as its final home should become too weak at the place where it is cut so that there may be danger of its falling to the ground, then the larva goes to work and either strengthens it with silk which is fastened to the twig or petiole, or ties the apical portion of the tube to another leaf or cuts that portion of the leaf which contains the tube from the rest of the leaf, so that either the whole or only that portion which contains the tube hangs suspended from another leaf. The larva lives in this tube most of the time only coming forth to feed; when disturbed it retreats

into the tube out of sight. In feeding, it draws other leaves, one after another, towards it and fastens them with threads of silk, thus forming a nest. Some of these partially devoured leaves soon turn brown and die, thus rendering the nest quite conspicuous."

Prof. Fernald, of the Hatch Experiment Station, thus describes the operations of this pest: "These caterpillars make their appearance about half grown in early spring, when the buds of our fruit trees are beginning to swell, and eat their way into the bud, thus destroying it. If one bud does not suffice they go to a second and so on. When the terminal bud is destroyed the growth is continued from a lateral one, and, as often occurs, the terminal bud of this lateral branch is destroyed by these minute caterpillars, thus giving a peculiar appearance to the older trees of an orchard, so that one can easily recognize the work of the bud moth by the irregular growth of the branches.

The moths emerge during the latter part of June or early in July and lay their eggs on the leaves of the apple and various other trees. The young, as soon as hatched, feed on the leaves, and are about half grown when the cold weather comes on, and they hibernate in that stage."

Prof. Slingerland, of the Hatch Experiment Station, in bulletin No. 50 of that station, gives a full account of this insect, and to this report we are indebted for the engravings herewith given and for many of the facts herein stated, thus gives the habits of the bud moth: "After their first appearance in the spring the larva continue to feed mostly at night in the opening fruit and leaves and buds, for six or seven weeks. During this time they probably cast their skin three times, but no change takes place in their general appearance except the natural increase in size. Soon after reaching maturity the larva begins to make preparations for its transformation to the quiescent stage of the insect—the pupa.

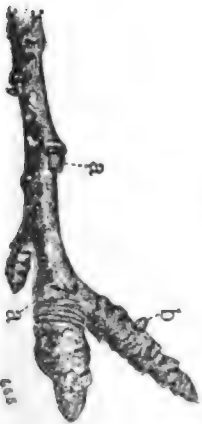
Within a tube, formed by rolling up one side of a leaf or by bringing together two or three half devoured leaves and securely fastening everything with silken threads, the larva retreats and lines the interior with a thin, closely woven layer of silk. This forms the cocoon of the larva, within which it is soon to undergo its wonderful change to a pupa. In some cases the cocoon is formed on the leaf or twig and covered on the outside with the fine wool taken from the leaves or petioles, thus giving it a close resemblance to its surroundings, so that it is not easy to detect it. Those larva which emerge first on the earlier varieties of trees attain maturity and begin spinning their cocoons in the latter part of May. The date of pupation varies from June first to the twenty-fifth in this state (New York).

The pupa lies quietly in its silken chamber for about ten days. It then pushes its head through one end of the cocoon and by the aid of the rows of tooth-like processes on its dorsum, it works itself along until the greater portion of its body projects from the end of the cocoon. The pupal skin then splits open over the head and along the back and sides and the delicate little moth escapes.

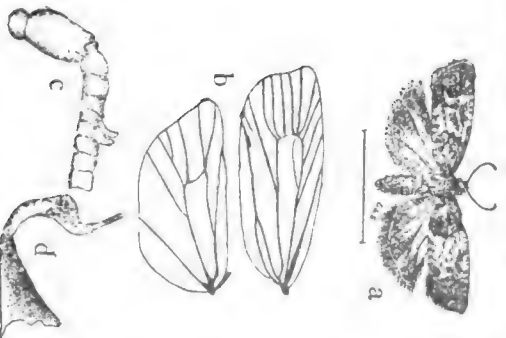
After crawling forth from its pupal skin and waiting a few minutes for its wings to expand and dry, the moth flies away and is soon ready to begin its mission of the perpetuation of the species. The moths begin to appear as early as June 5 in this state (New York), and have not all emerged by July 10. They are most active at nights. During



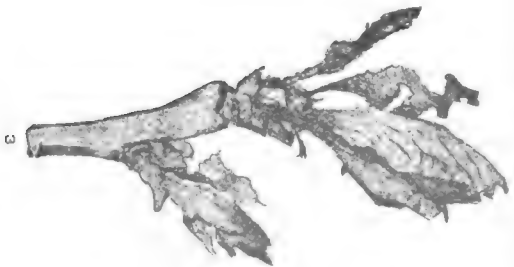
1. Work of larva on leaves.



4. Winter home of larva—(a, a and b.)



2.

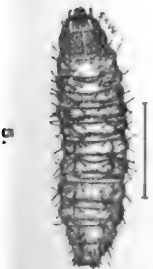


3. Work of larva on buds.

THE BUD MOTH—(*Tinocera ocellana*.)

3. Adult, twice natural size—(a.)

5. The larva, three times natural size.



5.

the day they remain quiet on the trunk and limbs of the tree with wings folded roof-like over the body. In this position they so closely mimic the bark of the trees as not to be readily seen. The moths live about two weeks in our cages."

Authorities appear to differ greatly as to the best means of checking the ravages of the pest. Prof. Fernald writes: "To destroy these caterpillars it is desirable to gather all the leaves from under the infested trees in the fall and destroy them, and also to shower the trees with one pound of Paris green in one hundred and fifty gallons of water." (See bulletin No. 12, Hatch Experiment Station, page 4.)

Prof. Slingerland, of the Cornell Experiment Station, writes: "Our observations here at the insectary, corroborated by those of Mr. Fletcher, in Canada, show that this gathering and burning of the leaves would be useless labor so far as combating the bud moth is concerned. For the larva are not on the leaves when they fall, but are snugly hidden in the twigs where they will be right on hand when the buds open. Of course, burning the leaves and other rubbish in an orchard is desirable under any circumstances, for these harbor many other injurious insects, but one cannot hope to check, in the least, the ravages of the bud moth in this way. (See Cornell Experiment Station, bulletin No. 50, page 26.)

Dr. Fletcher, Entomologist of the Canadian Department of Agriculture, writes: "Kerosene emulsion sprayed three times over the tree upon the twigs of which they were in winter quarters, inside their silken tubes, had no effect upon the larva, having failed apparently to penetrate through their silken covering."

Prof. Slingerland proposes the following plan, which he claims will and has proven successful: "However, we have now reached a point in following the life history of the pest where, we confidently believe, it can easily and successfully be combated. This point is where the little, half grown larva comes out from its winter quarters and begins feeding in the spring upon the opening buds. We have only to manage it so that the little larva's first meal in the spring shall be a poisonous one. This is the way the Codlin moth is so successfully kept in check; the little larva which hatches in the blossom end of the developing apple finds a tiny bit of poison served up for its first meal by the deft hand of the spraying machine. In a similar manner, if one can manage to have a little poison on the opening bud when the larva of the bud moth appears, the little creature can be effectually destroyed before it can do much harm. This can be easily and cheaply accomplished by spraying the trees with an arsenite.

Fruit growers usually do not begin to spray their trees until the blossoms have fallen. Recent investigations, however, have shown that the best results are obtained in fighting fungus diseases when the spraying is begun earlier. So that fruit growers are now being advised to spray their trees once or twice before the flowers open, with a fungicide for apple scab and other fungus diseases. Again, if fruit growers wait until the blossoms have fallen, the time to spray for Codlin moth, before spraying with an arsenite, the bud moth will have done the greater part of its damage."

Those of our readers who wish to pursue the life history of this insect further, will find practical information in bulletin No. 12 of the Hatch Experiment Station, and bulletin No. 50 of the Cornell Experi-

ment Station, in each of which Profs. Farnald and Slingerland give the results of their practical observations, and to which we are indebted for the illustrations and condensed accounts here used.

REPORTS OF HONORARY OFFICERS.

REPORT OF THE BOTANIST.

BY THOMAS MEEHAN, *Botanist of the Board, Germantown, Pa.*

Among the various questions brought to the attention of the Botanist of the Board the past year, there are two which have a public interest, and deserve more attention than has been given to them. The one relates to the possibility of improving edible products otherwise than by seed; the other, what endeavors, if any endeavor at all, is worth making in order to add to our lists of fruits and vegetables, by improving our native plants.

The first of these came in the case of an inquiry from Louisiana, in the first instance, regarding the improvement of the sugar cane, and has been followed by similar inquiries regarding Pennsylvania fruits. As the whole question is a general one, affecting Pennsylvanians as well as the people of Louisiana, it has been thought worthy of discussion in the general report.

Sugar cane is not raised from seed, but by cuttings of the stems. Cane varies in the quality of the sugar. Is this owing to conditions of the season, soil, or of changing climate? If not wholly this, but by some inherent power to vary, one might get varieties by selection as well as we do with other plants by seed. Many eminent botanists have been consulted by the sugar planters, and usually with the reply that by seed alone could new varieties be introduced and permanently propagated from as a marked deviation from the parent form.

But there are many instances of changes in fruits and flowers by what is known as bud variation, accompanied by what one must regard as change in chemical character, that ought to give encouragement to the sugar planter who seeks to increase his crop of sugar by selecting for propagation those shoots which seem to contain a high percentage of saccharine matter. The nectarine, a fruit now seldom seen in our market, because its smooth skin makes it a favorite with the *Cureculio* equal to the plum, was originally but a branch that pushed out from a peach tree. It is simply a peach with a smooth skin. When the stones of the nectarine are sown they usually reproduce themselves. That is to say, nectarine plants are raised from nectarines, though occasionally peach plants will come from the nectarine stones. Yet the difference in flavor is so great that any one who is acquainted with both fruits can readily tell with their eyes



3.



1.



2.

1. Adult leaves of the Cedar. 2. Juvenile leaves of the Cedar. 3. Root of Evening Primrose.

closed, whether they are eating a peach or a nectarine. There must be some chemical change in the nectarine from the peach, or the tongue could not otherwise distinguish them. It is, indeed, doubtful whether it is possible for any change in form to occur without some change in chemical character going with it. There are those who believe that even life itself is but a mode of chemical action, the exact nature of which has never been, and probably never will be, discovered. As we can only know of the differences in things by their forms, the inference would be that any change in form has a corresponding chemical change, though in many cases of individual changes, they would be too slight to be evidenced to any of our senses. Among vegetables there are occasional great departures as in the case of the peach and the nectarine. The varieties of sweet potatoes are all from bud variation, as the plant never seeds with us. But the flavor of the dark red sweet potato is easily distinguished from that of the light yellow kind. Purple skinned potatoes will occasionally come from the same plant as that which produces white ones, and these have just as distinctive characters from the original in flavor as if they had been raised from seed. There are differences in odor, as every one knows, among the varieties of roses. Many of the popular roses of the florists have been from bud variation. A branch, without any explanation that the florist can give, pushes out from the parent with wholly different characters from the others. This is propagation from grafting or by cuttings and the variation is preserved. It varies in odor as well as in other characters, and odor varies surely through chemical differences.

Possibly the best illustration is furnished by variations in the foliage of the common cedar and other members of what is known as the coniferous family. During the first year of their lives the foliage of coniferous trees, especially those of the juniper and cedar section are very different from that which they take on subsequently. At maturity they become wholly united with the branches, as shown in Fig. 1, but during the first year they are wholly free from the branches like the leaves of any other plant and as represented in Fig. 2. In the red cedar, however, as any one may observe by examining young plants, the youthful character of the foliage does not wholly end with the first year, but many branches will show the juvenile and free-leaved character for many years. Once in a while every leaf will be of this condition for years and can be propagated and re-propagated from till the florist may almost believe he has distinct species. The illustration given in Figures 1 and 2 are however, from the same tree, although the tree retained the character of No. 1 for 20 years. It is a Japanese form of cedar, known in gardens as *Retinispora squarrosa*, and taken for illustration because it is more marked than is usual in the common forms of red cedar. We have only to rub a handful of foliage in each case, and smell, to understand the great difference in character which the foliage on the same tree possesses.

There seems no room for doubt but that the propagator is wise who selects for seed, or for grafting or other methods of propagation, those fruits or branches that are the nearest to his ideal character.

The deaths from eating poisonous mushrooms the past season turn attention to the frightful ignorance prevailing about common things. The larger portion of the mushroom family are wholesome and nutri-

tious, but because of the prevailing ignorance of everything about them, we can only advise the masses to eat nothing but the one which everybody has learned to be the good mushroom. It is useless to tell an ignorant person how to distinguish a poisonous from a wholesome mushroom. The knowledge can only safely be gained by the same method that we know any one is good, that is, by learning the fact from someone who knows.

Since the body of the report was written, the New York Tribune notices editorially that the State of New York publish charts of edible and noxious fungi, to be distributed free to all public schools, libraries and kindred institutions, the matter being before the Legislature for the necessary appropriation. Such charts are issued by most of the European governments, particularly by France and Sweden. The fungi of Pennsylvania are, with few exceptions, similar to those of New York, and it might be well for our State authorities to co-operate with those of New York in this great and valuable educational move.

The same ignorance prevails about the useful properties of our common plants. Numbers could be developed into delicious fruits and vegetables with the exercise of a little care and intelligence. In Europe more thought is given to those things. Their experimentors are continually sending to America for our wild plants with a view for improvement, and which we ought to do a little of ourselves. One of our wild plants they have taken hold of, and have already so admirably improved on it that it is frequently seen in considerable quantities in some of their markets. This is our common evening primrose (*Oenothera biennis*). Even in its uncultivated original state, it makes a root somewhat succulent and of considerable size. The one illustrated was two inches thick at the crown and dug without any particular selection in an abandoned cornfield. It should be remarked that seed of biennials, such as this, must not be sown as soon as ripe, but saved till spring. Then nature seems to give particular attention to root development. Nearly all our garden vegetables have been improved in this way. The cabbage, lettuce, beet, celery, parsnip, carrot, turnip are all biennials. If the seed were sown as soon as ripe, the plants will all run to flower the ensuing spring. They lose this power and make large leaves or roots simply by sowing the seed a little beyond the time nature would sow it.

COLIC IN HORSES.

BY DR. F. BRIDGE, *Veterinary Surgeon of the Board, Philadelphia, Pa.*

In taking up this very interesting subject, it may be mentioned that while there is no dispute as to the different kinds of this disorder (namely spasmodic and flatulent) there is a wide diversity of opinions as to their causes. Horsemen and horse owners generally attribute this disease of the bowels to numerous causes; manner of feeding,

hard driving, no work, drinking too much cold water, and other causes too numerous to mention. In my experience I have found in true colic but one main cause, namely indigestion. Of course, there are exceptions to this rule, which are seen principally in spasmodic colic; this disorder may be caused by trivial circumstances, such as a horse being worked hard with improper or insufficient food; another instance is where an animal is driven a very long distance and is exhausted. Letting the animal have a large drink of cold or spring water is, in itself, sufficient to cause spasmodic colic, as this form of disease is caused purely by a spasmodic contraction of the muscular coating of the intestines; a sudden change of any kind is likely to cause this derangement. There are also other causes of colicky pains, such as intestinal secretions, bot worms, intestinal calculi or mesenteric abscesses; still, these, I do not think, should be classed as true colic, but should be described by themselves or classed with enteritis.

When colic is of a purely intestinal nature the symptoms are an uneasy expression of the face, looking around at the side, pawing, lying down, rolling, suddenly arising, throwing themselves down, lying outstretched for a while as if free from pain, then a return of the same symptoms again, either in a modified or an aggravated form, and while these colicky pains remain, the breathing gets more frequent, full and hard, the pulse rises, sometimes more, sometimes less, is full and hard, decreasing to normal during intervals of ease. The bladder becomes full and distended and will be found to be rigidly contracted at the neck. This has led some to believe that this disorder is purely an affection of the bladder, as the animal stands outstretched and strains, often emitting a few drops of urine. A small amount of faeces, sometimes soft, sometimes hard, is passed at intervals during these paroxysms of pain, which continues until the animal is relieved or dies from exhaustion, or enteritis.

In the treatment of this disorder, the immediate use of a cathartic is very beneficial in removing the cause of pain, for there is always an irritant of some kind which produces this spasm, to remove which, a pill composed of from five to eight drachms of aloes and one drachm of camphor and two drachms of capsicum or red pepper is very efficient; or, where not procurable, one pint of linseed oil and one ounce of laudanum may be substituted. This can be followed by a dose every twenty minutes of from one to two drachms of *cannibus indicus*. Frequent injections, by the rectum, of warm water in which is dissolved a small quantity of castile soap.

Often in mild cases of spasmodic colic, a simple dose of tincture of opium, two ounces; of sulphuric ether, one ounce; oil of peppermint, two drachms, will give instant relief.

Flatulent colic is of a more serious nature and is caused by food that is easy of fermentation, such as green corn, mouldy or green food. The symptoms of pain in this form of colic are not so acute but are much more constant than in spasmodic colic. The abdomen becomes intensely swollen, resonant upon percussion, the pulse rapid and feeble, breathing difficult, and extremities become cold; animal reels to and fro and backs around the stall, throwing itself down and gradually becomes delirious, running its head against the stall, twitching of the muscles, retraction of lips, cold perspiration, and,

if not relieved, death from rupture of the intestines, asphyxia, or from blood poisoning caused by absorption of poisonous gases in the blood. In the treatment of this form of disorder, relief must be afforded as quickly as possible and in addition to the administration of a cathartic, as in spasmodic colic, the administration of carbonate of ammonia in 2 drachm doses, also linseed oil, one pint; turpentine, one ounce; tincture of opium, one and one-half ounces; mix all together and give in one dose. Rubbing the abdomen with sweet oil, turpentine, liquid ammonia and water, equal parts, is very beneficial. Frequent injections of warm water and Castile soap will help the bowels to operate. In acute or very severe cases of flatulent colic, when the animal is very much distended with gases, it should be punctured with a trocar and canula. This instrument can be procured from any surgical instrument maker. It should be about three-sixteenths of an inch in diameter and six inches long, and should be inserted in the middle of the flank about a hand's-breadth from the point of the hip bone, on the right side, with an inward and downward tendency. Before the trocar is inserted, the skin should be punctured with a sharp and fine pointed bistury, otherwise the thick skin of the animal will often make it difficult to insert the canula. If the canula becomes clogged with faeces and the gases cease to escape, it should be opened with a blunt probe being inserted. After the pain is reduced by this method, give small doses of the following mixture which should always be kept on hand for immediate use in cases of colic:

Spirits of turpentine,
Fluid extract, *cannibus indicus*.
Tincture of ginger.
Spirits of camphor.

Two ounces of each. Mix all together. Dose: Two tablespoonfuls. This should be repeated at intervals of a-half hour until the animal is relieved. After recovery, great care should be exercised in feeding, as the muscular coat of both stomach and bowels have been weakened by distention.

PRACTICAL DISINFECTION.

DR. G. G. GROFF, *Sanitarian to the Board, Lewisburg, Pa.*

In our day, when so much is said of disinfectants and of the necessity for using them, it is well for all to know something of the nature of these substances, and the manner of properly employing them. A disinfectant may be defined as any substance capable of destroying the power of infectious material. Antiseptics are substances to prevent decay. Deodorants are substances to neutralize or cover up bad odors.

In popular belief, a disinfectant is a substance which conceals one bad odor by producing another. Salt is an antiseptic. In general, it prevents decay. Commercial carbolic acid, such as is often offered

for sale at the stores, is simply a deodorant covering up a noxious vapor or gas, but not destroying it.

A bad smell is nature's warning of danger. Mould, dampness and foul smells should never be neglected. In general, it is much better to keep all our premises in such a condition of cleanliness that disinfectants will not be needed. In this respect, prevention is better than cure, and also far cheaper, but there come to all, times when it is necessary to use substances which have the power of destroying noxious properties in substances about us or in articles which we must use. It might here be borne in mind that the efficacy of a disinfectant does not reside in its powerful odor. Some of our best disinfectants are entirely without odor, and a large part of the disinfectants which enjoy popular patronage are possibly without any disinfecting value whatever.

Reliable and Safe Disinfectants. First, sunshine and fresh air; second, whitewash; third, boiling water, dry heat and steam; fourth, fumes of burning sulphur; fifth, sulphate of iron (green vitriol, copperas); sixth, dry earth, sifted coal ashes, slaked lime, ground plaster.

1. **Sunlight and Free Ventilation.** Sunshine and oxygen are nature's great disinfectants. Could they have free and constant entrance to our habitations, except where men are aggregated in great numbers, no other disinfectant would be needed. They have no equals, and no substances known to science are substitutes for them. In sunlight and pure, fresh air, the germs of disease cannot long live. It is well said of the habitation where sunlight cannot enter, "sickness is often present." Sunlight and fresh air should flood every nook and corner of the house and the surrounding premises. Trees, curtains, blinds, ivy—whatever stands in the way should be removed. When a house, or a single room in a house, is disinfected after sickness, or for any other cause, too much stress cannot be laid upon the subsequent and long continued exposure to sunlight and fresh air.

2. **Whitewash.** This is a most valuable and cheap disinfectant. Its use has come down to us from remote antiquity. Of late years it had been largely displaced by more expensive chemicals, but recent experiments have demonstrated that fresh lime is a potent destroyer of those forms of bacteria which produce sickness in the human family. Whitewash should be used liberally in the cellars, basement rooms, water closets, or wherever there is a tendency to dampness or mustiness of walls. In such places, not once a year, but just as often as is necessary to keep a place sweet and clean. Whitewash should be used more frequently in the summer months than in the winter. Theoretically, whitewash is the best covering for the walls of our rooms, from the fact that every time the walls are whitewashed they are disinfected.

3. **For drains, cesspools, etc.,** a solution of copperas (iron sulphate) should be used, three to five pounds to a pailful of water. It should be applied in sufficient quantities and once or twice a week, as found necessary. The solution may be made up in considerable quantity and then used as needed for the drains. The best time for application is at night, after the use of the drain is over for the day. This will allow the chemical time to perform its work properly. Applied in the morning or during the day, it may be washed out in a few minutes by an influx of water before it has accomplished its work. Privies

may be disinfected by throwing into them a large quantity of earth, or coal ashes, or gypsum, but it would be much better to clean out the vault, fill it up and use an earth closet. The privy vault is one of the abominations of our homes which should everywhere be abolished.

4. Disinfection of articles which can be washed. These should be placed in boiling water which contains in each gallon four ounces of zinc sulphate and two ounces of common salt. It is very important that they remain in this water an hour or more, and that boiling water penetrate to every part, which it will not do unless the goods are opened up and spread out with care. Too many goods should not be placed in the water at once, or it will be chilled down so that the disinfection will not be complete.

5. Disinfection of articles which cannot be washed. Beds, woollen clothing and furniture which have been exposed to the germs of contagious disease, such as smallpox, scarlet fever, cholera, or similar diseases, should be destroyed by fire. The beds, certainly, should be burned. Articles which have been about sick people, but which are not necessarily infected, as clothing, may be exposed for a long time to the air by being hung on lines, or may be buried in the earth, when they may again be used, but if contaminated with the discharges from the patient, it would be better to destroy by burning all such articles.

6. In the dairy. Dairy utensils should first be washed in luke warm water to remove the milk, butter, etc., and thoroughly scalded and then exposed to circulating air and sunshine. Soap and chemicals cannot safely be used here, because of the readiness with which milk absorbs all foreign tastes and odors.

7. Drinking water. Where it is absolutely necessary to use suspicious water, this should always first be boiled. Boiling will destroy the noxious properties which may be in any drinking water. To make such water palatable for drinking purposes, it has been recommended that it be boiled with exhausted tea leaves. This will give it some taste, and the astringent effect of the leaves will be good.

8. Disinfection of a house or room in which a contagious disease has existed. Thorough disinfection demands that each room as it is disinfected should be vacated by its occupants. All articles of clothing and bedding should be spread out, opened up and hung upon lines. All the closet doors and bureau drawers should be opened. The fireplace, the windows, and all openings, thoroughly closed. Then, depending upon the size of the room, from 5 to 10 pounds of brimstone or flowers of sulphur should be taken, placed in an iron dish supported on bricks over water, some coal oil added and the whole set fire to. The room should remain closed for twenty-four hours after the sulphur has burned. It should then be thoroughly ventilated by opening doors and windows. In case of smallpox, or similar contagious disease, the ceiling should be whitewashed, the paper stripped from the walls and burned, and all the furniture, wood work, as well as the walls, should be washed with a weak solution of corrosive sublimate in the water. The room should be opened to the air and sunshine as long as possible before it is again occupied. It should be added that in burning the sulphur, water should drop into the pan of burning material so as to produce steam at the same time, as it is found that vapors from dry sulphur are not so efficient as those acting in the presence of moisture.

9. Disinfection in the sick room. During sickness it is sometimes necessary to use disinfectants. The vessel which receives the discharges of the patient should, in general, contain a disinfectant. Lately a solution of corrosive sublimate has been recommended for this purpose, but since corrosive sublimate is a very expensive drug, people are not inclined to use it largely. In place of corrosive sublimate we may employ a solution of quick lime, which is entirely inexpensive and not dangerous. The solution of lime should be placed in the vessel when it is brought into the room. After the vessel has been used, more of the solution may be placed upon the excreta, should remain on them for some time and then they should be buried in the earth distant from the house and from any stream of running water.

Carbolic acid, chloride of lime, as well as some other well-known disinfectants should be avoided, from the fact that these commercial articles are often of uncertain purity and strength, and also because by their odors they are likely to cover up the noxious odors of decomposition, and because people at large believe that so long as carbolic acid or chloride of lime can be smelled there is no need of further care. A bad smell is a warning of danger and should never be covered up, but removed, root and branch, as soon as possible.

REPORT OF MICROSCOPIST AND FOOD INSPECTOR.

BY H. LEFFMANN, M. D., *Philadelphia, Pa.*

In this department, probably no topic has excited more discussion and dispute than that of the adulteration and impurities of milk, and the preventative legislation in regard to them. This discussion has been widespread, but has been especially active in Pennsylvania, in consequence of bills introduced last winter into the Legislature by the Philadelphia health authorities.

Legislation in reference to the milk supply has been advocated by the Philadelphia Board of Health for a long time. Dr. Ford, the president of the board, has been especially active. An ordinance of councils was obtained some years ago, but it was deemed insufficient as to the standard of composition of normal milk, and various expedients were resorted to, to widen the functions of the milk inspectors. It was finally decided to appeal to the Legislature for an act providing, not only for a standard of composition, but for veterinary inspection of dairies. The act was prepared apparently after much deliberation, at least ample time was allowed for such deliberation, and an effort was made to secure a favorable public opinion for it by the publication of expert reports. Dr. E. O. Shakespeare, during his term of service as port physician, made an extended report on the relation of milk to mortality, and advised various drastic measures of legislation, calculated to give the Philadelphia Board of Health great power in controlling the milk supply. The bill involving this plan was duly introduced and was bitterly opposed by several classes of persons. It was found that it could not pass in its original form, and amendments

were proposed, but the bill failed to receive in any form the sanction of the standing committee. Later in the session, an effort was made to extend to Philadelphia the Act of 1885, but this also failed.

I believe that all who desire to be just and pay some attention to the principles of liberty on which our government is founded, will be satisfied with the defeat of these bills. The absurd defects of the first one were admitted by some of its most active promoters. Although apparently written after much thought and inquiry, and upon data furnished by the milk inspector of Philadelphia, who has excellent facilities for getting information, the bill contained requirements which are impracticable. For instance, condensed milk was required to have 25 per cent. of fat. When it is remembered that the brands of condensed milk now on the market do not usually contain more than half that amount, and that some of these brands are in the highest favor with physicians and are found to give satisfaction, it will be seen that the effect of the bill would have been disastrous. I took occasion to address the inspector of milk, concerning this clause, asking for the data upon which it was based, especially as to the analyses of samples of condensed milk which led to such a standard, but received from him only the curt reply that he had no data on the subject. As I knew that Dr. Shakespeare had been largely consulted in the preparation of the bill, I addressed the inquiry to him, and he stated that the clause had been introduced inadvertently and that he had suggested an amendment of it so as to correspond with accepted standards of composition of condensed milk.

The extension of the Act of 1885 to Philadelphia was fortunately also prevented, though there was, at one time, an apparent danger of its success. The act was introduced in an incomplete form, consisting merely of the clause prohibiting the sale of impure milk. The clause, by itself, was likely to receive the assent of most citizens, and in the circular inviting public support, issued by the board of health, no mention was made of the absurd and exploded standards which would have been put in force. Citizens were asked to urge upon legislators the passage of the act "to save life."

Much of the dispute concerning this legislation has been due to the efforts to prevent the sale of skimmed milk. I am not aware of the reasons which actuated the board of health in this respect. The given reason, viz, that skimmed milk is unwholesome or impure, can scarcely be offered as demonstrated. If held at all, it must be merely an arbitrary opinion, which has not been reached by any definite line of inquiry. In the bill first introduced, the sale of skimmed milk was absolutely forbidden. Any removal of cream was sufficient to constitute an adulteration and render the sale of the milk a misdemeanor. When it remembered that the published standard upon which the Board determine adulteration is high and invariable, it will be seen that frequently a milk slightly deficient in fat might be condemned as skimmed milk. A little discussion of this bill before the committee elucidated the fact that such a severe rule was neither just nor practicable, and, although some of the advocates of the bill were dissatisfied, an amendment was admitted permitting the sale of skimmed milk when containing not less than a certain percentage of fat. A powerful effort was made, however, to exclude separator milk. The agitation against this variety of skimmed milk has been, in my opinion, unjustly conducted. It has frequently been designated sep-

arator slop, although there is nothing about it that is disgusting or suggestive of refuse, more than cheese, milk-sugar, whey or butter-milk. These are sold, and extensively used. Persons who find pleasure in them are permitted to obtain them, and no one considers any of them as unwholesome foods, or as legitimate objects of restriction. Separator milk is, in fact, the purest form of milk in some respects, for the action of the separator causes the removal of much filthy matter that is ordinarily present, such as fecal matters, particles of soil, tissue, and some form of microbes. Moreover, competent authorities in various countries declare that milk entirely free from fat has much food value, and this must be our opinion until unanswerable testimony shows to the contrary. The mere ipse dixit of some sanitary officer will not convince us.

In connection with this topic it will be appropriate to refer to the average composition of whole milk. This subject has been discussed in previous reports by Prof. Cochran, but as new data are being continually brought forward, and as the question is sometimes arbitrarily and incorrectly judged, it will bear argument.

That the fat of milk is subject to decided variation is admitted by all, and hence, its percentage is not available alone as a test of purity, except as indicating skimming. The dissolved solids, are, however, fairly constant. They are technically known as the solids not fat. To understand the standards adopted for pure milk, it is necessary to describe briefly the original methods of milk analysis. Wanklyn, an English chemist, developed a method which consists in evaporating in a small (platinum) basin a known amount of the milk until the residue is practically dry. This takes several hours and the weight is considered to represent the total solids. From this the fat is extracted by successive portions of ether, and the undissolved residue is weighed and designated as "solids not fat." This includes the casein, sugar and mineral matters. It is obvious that, if the fat is incompletely removed the analytical figures will lead to an exaggeration of the proportion of non-fatty solids and a diminution of the fat. Now, this is what has occurred in the history of milk analyses. Wanklyn's method fails to extract a noticeable amount of fat, some times 0.5 per cent. remaining in the residue. Under such an error, analysts have naturally tended to fix the standard for non-fatty solids too high.

The error in Wanklyn's method was detected several years ago, and methods of analysis which enable the extraction of all but a minute portion of the fat were devised. It is, therefore, found that milks yield, by the newer process, a higher proportion of fat and lower one of solids not fat, than by the Wanklyn method. Careful analysts have changed their standard of purity to meet the changed methods. Thus, the Society of Public Analysts (of Great Britain and Ireland), which has undoubtedly done more than any other organization to place milk analysis on an accurate basis, originally required 9 per cent. of non-fatty solids and 2.5 per cent. of fat as a minimum of pure milk, but, in accordance with the more perfect methods of fat extraction, has changed these standards to 8.5 per cent. and 3.00 per cent., respectively. This standard is regularly used throughout Great Britain and Ireland, and within the past year Dr. Vieth, one of the most experienced members of the Society, has expressed himself as follows in regard to it:

"My object is by no means to raise the cry that the standard adopted by the Society is too high; on the contrary, I think it very judiciously fixed, but in upholding the standard of purity it should not be forgotten that the cows have never been asked for, nor given their assent to it, and that they will at times produce milk below the standard. A bad season for haymaking is, in my experience, almost invariably followed by a particularly low depression in the quality of milk, toward the end of winter. Should the winter be of unusual severity and length, the depression will be still more marked. Long spells of cold and wet, as well as of heat and drought, during the time when cows are kept on pasture, also unfavorably influences the quality and, I may add, quantity of milk."

We can see, then, clearly how unjust as a basis for determining adulteration, is the Pennsylvania Act of 1885. This requires a proportion of 9.5 per cent. solids not fat, based, evidently, on the old (Wanklyn) method, by which a milk containing only 9.0 per cent of such solids might give apparently 9.5, the extra 0.5 being fat which remained in the residue. Under proper methods of fat extraction this same sample would give only 9.0 per cent. of non-fatty. Thus we would have the absurdity of a sample of pure milk being indicated as adulterated because a correct process of analysis is employed.

For the purpose of milk inspection in Pennsylvania, the standard of of the Society of Public Analysts will be found ample. The effort to fix the limit of non-fatty solids at 9.0 per cent. should be abandoned. The Philadelphia Board of Health labored for this in its efforts in councils some years ago, but, fortunately, could not secure it. The milk inspector of the board, however, uses the figure 9.5 as a standard of calculation, and this could show, if he were consistent, that much pure milk contains added water.

Much error is shown in the Act of 1885 as to the proportion of cream in whole and skimmed milk. No standard of proportion of cream should be adopted. The amount of cream that rises depends on several circumstances.

The limit of 8.5 per cent. of non-fatty solids is not always reached in unadulterated milk from apparently normal cows. Prof. C. B. Cochran has, in a former report of the Board, given a few such instances, and the following show additional authentic cases:

Number.	Fat.	Solids not fat.	Total Solids.
1	3.99	8.36	12.35
2	3.11	8.33	11.44
3	3.05	8.33	11.38
4	3.23	8.44	11.67

The first case was a sample of milk from a carefully managed dairy near Philadelphia, and was undoubtedly genuine. Nos. 2, 3 and 4 are monthly averages of cases recorded by the New Jersey State Agricultural Station. Mr. H. Droop, Richmond, who, as chemist to the Aylesbury Dairy Company, of London, England, has had ample opportunity to observe fluctuations in milk, has noted recently, in a herd of 60 cows, that nineteen per cent. of the samples showed between 8.38 and 8.50 per cent. of non-fatty solids.

Soxhlet, a German authority, states that the normal cow's milk will contain at least 8.5 solids not fat, and 3.5 of fat, making 12 per cent. total solids. Vieth, who has made the most extended observations, recently published a summary of 120,540 analyses, extending over 10 years, the earlier results being re-calculated so as to make all strictly comparable. His average of all is:

Fat,	4.1
Solids not fat,	8.8
Total solids,	12.9

A notable variation is shown by Vieth's tables to occur at different seasons. The poorest quality occurs about April. A low figure is also seen in July. In the fall the quality rises, being highest in October and November. The variations affect mainly the fat, but an increase in the proportion of fat is usually attended by a slight increase in the proportion of non-fatty solids. These statements apply to English cows, but substantially the same relations appear in American herds. Dr. Beam and I have compiled from the recent reports of the New Jersey State Experiment Station the following summaries, showing the effect of season and breed on the composition of milk:

AVERAGE COMPOSITION OF MILK OF DIFFERENT BREEDS FOR EIGHT MONTHS.

BREED.	Specific gravity.	PERCENTAGE.					
		Water.	Total solids.	Fat.	Casein.	Sugar.	Ash.
Ayrshire,	1034.1	87.30	12.70	3.68	3.48	4.84	0.69
Guernsey,	1035.0	85.52	14.48	5.02	3.92	4.80	0.75
Holstein-Friesian,	1032.8	87.88	12.12	3.51	3.28	4.69	0.64
Jersey,	1035.3	85.66	14.34	4.78	3.96	4.85	0.75
Short Horn,	1033.9	87.55	12.45	3.65	3.27	4.80	0.73

VARIATION ACCORDING TO SEASON.

	Ayrshire.		Holstein-Friesian.		Jersey.		Guernsey.		Short-Horn.	
	T. S.	Fat.	T. S.	Fat.	T. S.	Fat.	T. S.	Fat.	T. S.	Fat.
March,	13.00	3.95	12.46	3.89	14.99	5.36	15.29	5.46	13.99	4.69
April,	13.09	3.85	12.39	3.84	14.83	5.32	14.95	5.20	12.76	3.89
May,	12.97	3.54	12.67	3.65	13.67	4.30	14.00	4.57	12.05	3.24
June,	12.58	3.42	12.99	3.73	13.42	4.08	13.86	4.55	11.97	3.23
July,	12.72	3.71	11.44	3.11	13.46	4.13	13.85	4.54	11.89	3.28
August,	13.08	4.07	11.38	3.05	13.60	4.22	13.93	4.81	12.08	3.56
September,	11.85	3.26	11.67	3.23	15.00	5.08	14.67	5.22	12.24	3.47
October,	12.27	3.60	12.08	3.55	15.75	5.71	15.28	5.78	12.61	3.82

From these data, which might be extended to a much greater length, we may conclude that while it may be permissible in special cases, such as the purchase of milk under contract, or in the operation of a large dairy, to reject samples which yield below nine per cent. of non-fatty solids, it is not just to exact such a standard for purposes of public inspection, and as a basis for penal proceedings.

The statements advanced by some milk inspectors that a low standard does not encourage the selection of a high grade of dairy cattle, or that milk showing below 9 per cent of solids not fat is from diseased animals, are inopportune or untenable. It is no part of the duty of a sanitary authority to encourage the selection of a high grade of dairy cattle, nor is it true that the animals which yield the low amounts of solids are diseased. It is a mere verbal trick to use such a term. Nor is it just to say that a milk containing less than 9 per cent. of non-fatty solids, or is deprived of its cream, is unwholesome. Very extravagant and misleading statements have been made in this respect by non-medical persons in Philadelphia.

It is, however, with reference to the propagation of disease through the agency of micro-organisms, that the milk question must be considered. There is now no doubt that scarlet fever, diphtheria, typhoid fever and tuberculosis are largely distributed by milk. The last disease has been found to be wide-spread in dairies, affecting many cattle, especially those of the most select class, which yield rich milks. Through these the milk becomes infected and the infection is carried to the consumers. When it is considered that milk is almost the only form of animal food that is eaten in the uncooked condition by civilized communities, the importance of the facts above noted will be apparent. Some interesting data as to the association of consumption, diphtheria, and similar diseases, with the maintenance of dairies have been collected, but the discussion of this feature of the question would be out of place here. Enough is known to show that raw milk is not a safe article of food, unless collected with such precautions as will prevent the introduction of infectious matter.

To remedy this condition, an inspection of dairies will doubtless be necessary. This can be carried on with most satisfaction by the State Board of Agriculture, and not, as was proposed, by agents of the board of health of Philadelphia.

To conclude, therefore, I may say that as far as fixing a standard of chemical composition of milk is concerned, it should be at the minimum standard—not over 8.5 per cent. solids not fat. The sale of skimmed milk should be allowed, provided it is distinctly marked as such, but no account should be taken of the amount of fat in it. It should be assumed that a skimmed milk may be entirely deprived of fat. Means should be taken to prevent milk being sent from dairies at which scarlet fever, typhoid fever, diphtheria or cholera prevail, or in which tuberculous cattle are found.

A topic which is attracting much attention in hygiene is that of the conditions under which immunity is obtained. Many interesting researches are being made, and it is not unlikely that in time many diseases will be practically exterminated by systems of vaccination, as is now the case with smallpox.

The United States Department of Agriculture has issued some interesting bulletins during the year, among which that on "Canned

Goods," and on nostrums for increasing the yield of butter, may be mentioned. The latter is especially interesting to dairymen.

MILK, SKIM MILK AND WHEY.

A STUDY OF THEIR COMPARATIVE COMPOSITION AND SPECIFIC GRAVITY.

BY PROF. C. B. COCHRAN, *Microscopist of the Board, West Chester, Pa.*

That the sp. gr. of a milk is dependent upon the composition of the milk, and varies according to the per cent. of each constituent, is generally admitted. Upon this fact is based Richmond's extended formula. Having given the sp. gr., total solids and ash of a sample of milk it is possible by means of this formula to calculate the percentage of fat, proteids, and sugar. The formula is as follows:

$P = 2.8 T + 2.5a - 3.33 F - .7G$ (P.—proteids; T.—total solids; A.—ash; F.—fat; D.—density; water at 60 degrees F. being 1, G.—1,000 D.—1000.)

From this formula Richmond calculates that each gram of proteids in 100 c.c. of milk raises the gravity 2.57 degrees, or that the density of the proteids of milk in solution is 1.346.

Dr. Dupré has found by direct experiment that one per cent. of casein raises the sp. gr. of milk 2.55, or that the density of casein in solution is 1.34.

Mr. Hehner, by a different method of investigation, concludes that the sp. gr. of casein in solution is 1.3106. From this figure we conclude that each per cent. of casein raises the gravity of milk 2.36 degrees.

I have recently made a comparative study of the sp. gr. and composition of milk and the whey obtained therefrom. One of my objects in this work was to obtain data for determining the effect of each per cent. of casein on the sp. gr. of milk, and the density of casein in the solution. The following table shows the results of my work:

	Specific gravity of milk.	Total solids of milk.	Solids, not fat, of milk.	Specific gravity of whey.	Total solids of whey.	Casein removed.	Effect of one per cent. of casein on specific gravity.	Density of casein in solution.	Effect on specific gravity of whey of one per cent. total solids.
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
1	1035.0	9.27	9.13	1028.0	6.62	2.51	2.83	1.394	4.23
2	1035.0	9.27	9.13	1026.6	6.10	3.03	2.80	1.390	4.36
3	.....	.....	.....	1026.6	6.10	0.52	2.69	1.370	4.36
4	1029.1	14.05	8.35	1028.5	6.62	2.33	2.78	1.386	4.80
5	1029.1	7.71	7.61	1024.9	5.98	1.63	2.63	1.358	4.16
6	1033.8	8.91	8.71	1028.2	6.50	2.21	2.62	1.355	4.34

In order to avoid, as far as possible, the influence of the fat, separator skim milk was used in all those analyses that were made to furnish a basis for determining the effect of casein on sp. gr. In the calculation, allowance was made for the effect of the small amount of fat still remaining in the skim milk.

The method of work was as follows: Having determined by analysis the total solids, fat, solids not fat, and sp. gr. of a sample of skimmed milk, a few drops of a strong solution of rennet or acetic acid is added to about one pint of milk in a flask, which is then tightly corked and stood on a water bath until coagulation has occurred and a clean whey separated. After thorough cooling, the whey is filtered, and, if clear, the total solids it contains and sp. gr. determined.

The difference between the total solids of the whey and the solids not fat of the skim milk is taken to represent the casein removed. Divide the loss of gravity between skim milk and whey by the per cent. of casein removed and the quotient represents the loss of specific gravity due to removal of one per cent. of casein.

The density of casein in solution is now found by the formula $D - D' = \frac{1 - x}{100x}$. D = sp. gr. of whey; D' = sp. gr. of skim milk minus all fat; x equals effect of one per cent. curd on sp. gr.

By this method of work the numbers in columns seven and eight were obtained. The average of these results show that each per cent. of casein removed lowers the gravity of the milk 2.72 degrees and that the density of the casein in solution is 1.376.

The solids coagulated by rennet freed from fat were found to contain 1.08 per cent. ash. All the remainder is regarded as casein or proteid matter. The disturbing influence produced by the removal of so small an amount of mineral matter with the casein would have only a very slight influence on the sp. gr. Moreover if this mineral matter is combined with the proteids as they exist in the milk, it is proper that it should be considered as a part of the proteid matter in determining its density in solution.

Although the results obtained do not agree as closely as is desirable yet I believe the average is reasonably near the truth.

The sp. gr. was obtained in all cases by weighing in a sp. gr. flask, furnished with side tube and cap. The solids were obtained by drying on asbestos fibre. The sugar of the residue from whey very easily caramelizes on drying, and for this reason it is more necessary to use an absorbent like asbestos for whey than for milk.

Having determined the sp. gr. and total solids of a large number of samples of whey, I conclude that when the coagulation is properly performed under similar conditions, the sp. gr. and total solids of whey of pure milk will vary within quite narrow limits. I find the sp. gr. to be 1027 or higher and, in all but one case, as low as 1028.5. The total solids vary between 6.5 per cent. and 6.9 per cent.

If a sample of whey be reheated, further coagulation will take place. In this way the sp. gr. of a whey was reduced from 1028 to 1026.6.

A milk that had been allowed to decompose for a period of 20 days furnished a whey that had a sp. gr. of 1025.5. This whey had an acidity corresponding to .76 per cent. of lactic acid. The lowering of the sp. gr. was a natural result of the fermentation.

If the number representing the sp. gr. of the whey above 1000 be

divided by 4.25, the quotient represents fairly well the per cent. total solids contained in the whey. For example, a whey of sp. gr. 1028 will contain $28 \div 4.25 = 6.59\%$ total solids.

As might be expected I find the whey of any given milk has the same composition no matter whether it is taken from the original milk, the cream, or skim milk. This being the case, a knowledge of the variation in sp. gr. and composition of whey of pure milk is of value in determining adulteration, especially when the milk comes into the hands of the analyst in a churned or soured condition. It is also equally valuable in testing cream for added water.

The following table illustrates the value of the whey test in this particular. It shows the sp. gr. of the whey in comparison with the composition of milk and cream, both in pure and watered samples.

Number.	Specific gravity.	Total solids.	Solids not fat.	Specific gravity of whey.	Total solids of whey.	
1	1030.7	14.32	8.78	1028.0	.....	Partially creamed.
2	1031.5	12.05	8.55	1027.0	.....	Poor milk
3	1027.3	10.90	7.50	1023.0	.....	Watered milk.
4	1020.4	12.05	6.15	1021.3	.....	Watered cream.
5	1031.8	14.68	9.49	1025.5	5.89	Whey of 3 weeks old milk
6	1031.0	12.05	8.45	1028.0	6.59	
7	1031.2	12.45	8.55	1027.0	6.35	
8	1032.0	12.90	8.80	1027.5	6.47	
9	1032.9	13.22	9.02	1027.3	6.42	
10	1032.4	12.98	8.88	1028.3	6.66	
11	1032.9	12.40	8.90	1027.0	6.35	
12	1027.8	8.81	8.71	1023.4	5.50	Watered skimmed milk

In closing this article, I desire to call attention to Hehner and Richmond's original formula, which is expressed in a working form in Richmond's milk scale. So far as I know, this formula has never met either the approval or disapproval of American chemists in any authoritative way. Chemists of repute oftentimes report very different results on what I believe are fair samples of the same milk. This difference is largely due to different methods of work, and, as a consequence, the results in one or both cases are incorrect.

I have had much experience with Richmond's milk scale, using it as a check in analytical work, and am very favorably impressed with its accuracy. If this formula, or some other one, should receive authoritative approval as a check in the analysis of normal milk, it might assist in establishing the adoption of similar methods of analyses, or at least in methods that give concordant results, and would serve to correct faulty analyses.

In case the chemist obtains results not in accord with the formula which may be chosen, let him regard it as necessary to investigate the cause of this disagreement.

Dr. Vieth, of England, has re-calculated all his analyses of milk, amounting to nearly 125,000, to agree with Richmond's formula, and he does not hesitate to say that this formula is correct, and that future investigation will not change it.

From my own work, I feel confident that this formula is just as reliable when applied to the milk produced in eastern Pennsylvania as it has been found to be when applied to that produced on the other side of the Atlantic.

DISTRIBUTION OF RAIN AND SNOW IN THE UNITED STATES.

BY MAJ. FRANK RIDGWAY, *Meteorologist of the Board, Harrisburg, Pa.*

Although rainfall is comparatively a local phenomenon, yet, in order to give an adequate idea of its distribution, it is necessary to assume that from observations made at scattered stations, we can obtain fairly accurate opinions as to the precipitation occurring over extensive intervening areas.

The heaviest rainfalls in the world are found on the western or southern coasts of the Eastern and Western Hemispheres contiguous to the seas. The prevailing winds bring the aqueous vapor that is so copiously deposited along the immediate coasts of these regions. In low latitudes the prevailing northeast trades also bring heavy rainfalls, as appears along the northern coast on South America and Central America. The least rainfall (five inches or less) occurs, where it might reasonably be expected, in the North Polar regions, where the very low temperature permits the air to contain but a comparatively small amount of aqueous vapor. Detached localities, to the leeward of mountain ranges in the interior of great continents, such as Asia and America, are also as scantily favored with rainfall as the Arctic regions.

From carefully collated data, John Murray, Esq., has estimated that over 22 per centum of the land areas of the earth has less than ten inches of rain annually; over thirty-one per centum has from 10 to 25 inches fall; 16 per centum from 57 to 75 inches, and 6 per centum has over 75 inches. The highest rainfall occurs in Sumatra, about 130 inches; the least in Greenland, 15.5 inches, closely followed by Australia, 15.7. In North America only 16 per centum of the area has under 1, and less than two per centum over 75 inches of rain.

The annual average rainfall, including melted snow, over the United States, varies in different sections of the country from less than four inches to more than one hundred inches, the quantity depending largely on the elevation, distance from the ocean, and the direction, either of the prevailing wind of the locality, or on accidental winds caused by the passage of storm centres across the country.

In the United States the last mentioned condition is the most conducive to rainfall, for, while precipitation is occasionally fed by local evaporation, yet its preponderating source is found in the vapor-laden winds from the ocean or inland seas. It thus results that the centre of aspiration induces winds favorable for rainfall in some quarters, and unfavorable in others. Blanford has pointed out that Kurrachee, with a steady monsoon wind of 400 miles daily, is not necessarily

avored with precipitation, but that in India deflections of the wind from its normal direction by local irregularities of pressure, increase the probability of rain in proportion to the amount of such deflection.

There is probably no part of the face of the globe where such an enormous area of country is favored with moderate rains—from 30 to 60 inches a year—as that portion of the United States to the eastward of the 97th meridian. From Minnesota, Iowa, and Missouri, eastward to the Atlantic coast, the annual rainfall varies from 30 to 45 inches. Southward to the 37th parallel the quantity of rain yearly is somewhat greater, ranging generally between 45 and 60 inches.

It is a general and tolerably accurate rule that the rainfall in the United States decreases with increasing distance from the ocean, and also incidentally with the elevation; but the variations are markedly different on the Pacific coast from those to the eastward of the Rocky Mountains. Along the Pacific coast the rainfall is greatest at the extreme northwestern point, and decreases quite regularly with the latitude, being least at the extreme southwestern part. Contrary to this rule, the rainfall of the Atlantic coast, with local exceptions, decreases from south to north.

An annual rainfall exceeding 44 inches occurs along the Atlantic coast and gulf coast, in the valleys of the lower Mississippi, lower Ohio, Cumberland, Tennessee, and lower Arkansas rivers, and along the Pacific coast to the northward of the 40th parallel. Except in a few favored spots, such as the Yellowstone Park, the rainfall is less than 20 inches over the country situated between the 100th and the 121st meridians. In southern Nevada, southeastern California, western Arizona, and southwestern Utah, to the leeward of the mountain ranges, less than eight inches fall annually, and in certain localities even less than three inches.

The astonishing increase of rainfall along the Pacific coast—from 12 inches at San Diego to 24 inches at San Francisco, 83 at the mouth of the Columbia river, and 105 inches at Neah Bay, Washington, is a striking climatic characteristic of that region. Indeed, Cape Flattery, the northwestern point of the United States, may be called a maximum rain centre, since from it the rainfall diminishes in all directions to the eastward and southward.

The heaviest rainfall in that section occurs on the immediate coast during the winter, when monthly rainfalls exceeding 20 inches are not very unusual at exposed points. Yearly falls of 100 inches or more of a record at several points, and the annual rainfall at Neah Bay is 105.2 inches. The following are the falls exceeding 100 inches for single years:

State of Washington—Neah Bay, in 1865-1866 (season), 140.9 inches; Tatoosh Island, 1867-68, 112.9. California—Nevada City, 1867-68, 115.3; Crescent City, 1881-82, 113.4; Bowman's Dam, 1871-72, 102.2. Oregon—Astoria, 1875-76, 112.5. In the United States other heavy rainfalls for a single year are those of Point Pleasant, La., 1880-81 (ten months only), 102.4, and at Baton Rouge, La., 1846, 116.4.

Although the annual rainfall at certain places along the Pacific coast seems very large, yet the average at some points on the west coast of Ireland and Scotland is more excessive. At Seathwaite, Borrowdale, the average annual fall amounts to 154 inches. India, however, far exceeds the rest of the world in the amount of annual

precipitation. The immediate southwest coast of India, bordering on the Arabian Sea, all of British Burmah, and Sumatra, have average annual rainfalls exceeding 100 inches.

The rainfall of Cherrapunji, Assam India, averages 493.2 inches per year, the largest in the world. This enormous rainfall is owing to the station being situated on the side of the mountain, which rises very precipitously 4,000 feet, so that the aqueous vapor ascending air of the southwest monsoon is condensed by the cold of expansion, and the rain is deposited in torrents. At this station in August, 1841, 264 inches, or 22 feet of rain fell, and in five successive days there was precipitation to the amount of 30 inches in every 24 hours. It is stated that in 1860, 699.7 inches or 58.3 feet fell at this station, and in 1861 occurred the enormous and almost incredible amount of 905.1 inches, or 75.5 feet. Since 1871 the rainfall has been measured by a government official, and so may be considered fairly trustworthy and accurate, and in this period the annual rainfall at Cherrapunji has varied from 551.9 inches to 283.0 inches, with a maximum monthly rainfall of 184.8 inches in June, 1876.

Probably the smallest rainfalls in the world occur in southeastern California and Western Arizona, in and near the valley of the lower Colorado, and in the section known as the Mohave desert. The stations which have annually, during the season from July to June, inclusive, falls of rain less than three inches, are: Yuma, Arizona, 2.81 inches; Bishop Creek, Inyo county, California, 2.02; Indio, San Diego county, California, 1.92; Mammoth Tank (same county), 1.88; Camp Mohave, Arizona, 1.85 inches. These last two stations doubtless have the smallest known rainfall on the face of the globe. Statements have been frequently made that rain never falls in these localities, but there is no year at any station where a measurable rainfall has not been recorded.

THE INSTINCTS OF THE HONEY BEE.

BY DR. GEO. G. GROFF, *Apiarist of the Board, Lewisburg, Pa.*

The honey bee has long been studied by naturalists, and is always an interesting object to which to turn when one is weary with other duties. The bee is one of the most intelligent of insects, and one of the most industrious. Some would say that its intelligence is all instinct, but many of its performances, whether instinct or intelligence, are certainly wonderful. Some of these matters we will consider in this paper.

The return of bees to their hives in a "bee-line" is certainly a wonderful performance, and no full explanation has ever been given as to how they do this. If we move a bee-hive during the night, doing this without disturbing the bees, the next day when they return from their honey-gathering expeditions, they will come to the old site of the hive and will fly about in great bewilderment. But, if in moving the hive the bees are excited or irritated, in a word, if they know that the hive is moved, they will mark the new location and return to it.

the manner in which bees use their stings is also interesting. A bee away from home gathering honey is not a dangerous object. Unless injured, it seems never to think of using its sting, but in the hive or near it, it is always alert to warn away every intruder.

The honey producing instinct of the bee is always worthy of thought. The bee gathers stores in seasons of plenty to carry it over times when it can find no food. But not only does the bee collect the nectar from many plants, but it transforms this into what we call honey. How this is accomplished, whether by the bee which gathers the honey, or by the young bees before they begin the active duties of life, is not known, but the sweets gathered from the plants are transformed and stored.

The intelligence of the bee (or instinct, if it must be called such) is exhibited when the honey flow for any reason suddenly ceases. At such times the bees at once stop rearing brood, and the drones are driven out of the hive and destroyed. If there is a large amount of brood in the various stages of development, and the food supply promises to become very short, the larval forms are removed from their cells, dragged outside the hives and left to perish. If one visits the bees early in the morning in such times of scarcity, he will often see the larva lying in large numbers just outside the hive, but soon after daylight the birds pick up these grubs and they are not to be found later in the morning.

In the building of the cells which are to contain the larvae, and also used as honey receptacles, the bee exhibits considerable intelligence. Cells are made of the least possible amount of material and of considerable strength. They exhibit intelligence in making these cells of different sizes. Thus, we find worker cells, drone cells, queen cells, and honey cells, each intended for a specific purpose.

The bee exhibits intelligence in feeding the young larval forms, which are worms, unlike themselves. When the development of these worms has proceeded through certain stages, the cells in which they lie are capped and left alone until the young bee emerges.

Bees exhibit intelligence in the production of a queen from a worker egg whenever their queen has been lost. This, it is well known, they are able to do, by giving the young worm a larger cell and feeding it on a peculiar food which is given to young queens only.

Intelligence is exhibited in the preservation of the drones when the hive happens to become queenless. It has been observed that the drones have been preserved for months when a hive was destitute of a queen.

Intelligence is exhibited in the manner in which they guard the entrance to their hives. In warm weather, we always find sentinels standing at the entrance. These appear to challenge every bee which attempts to enter the hive. How those belonging to one hive are distinguished we do not know, but probably the bees of each hive have some peculiar odor which these sentinels recognize, but this has been noted: Whenever a bee approaches a hive loaded with honey or pollen, it is allowed to enter, whether belonging to that hive or not. Stranger bees are not permitted to enter if they come empty handed.

The swarming instinct of bees is also interesting. We do not know positively what impels them to leave the parent hive. It may be overcrowding. Be that as it may, it seems almost impossible to prevent the formation of new colonies by swarming at the proper season.

In the use of artificial foundation, bee keepers have attempted to control the normal action of bees. This foundation is made only of worker cells, and some bee keepers thought that they could, by the use of foundation, entirely exclude drones from their hives, being of the opinion that drones could be developed only in the drone cells, but the queen lays drone eggs in the worker cells. The worker bees elongate these cells and enlarge them, so that the drone may develop in the same. It is not possible to keep down the normal number of drones by any efforts on our part, at least not in this direction.

The instincts of the bee are also manifested in the division of labor, which is known to be the normal condition of things in every hive. Some bees perform one labor, others another. Virgil seemed to have noticed this. We quote him, using Dryden's translation:

“Some o'er the public magazine preside,
And some are sent new forage to provide;
These march the fields abroad, and those at home
Lay deep foundation for the labored comb.
With dew, narcissus leaves and clammy gum,
To fill the waxen flowering some contrive;
Some nurse the future nation of the hive.
Sweet honey some condense; some purge the grout;
The rest in cells apart the liquid nectar shut.”

It is certain that for several days, possibly a week or more, the young bees do not leave the hive, but are engaged in various labors within it. Certain bees act as sentinels. Some keep the hive clean, for bees are thorough sanitarians.

The list here given by no means includes all the instincts which interest us, but we have given enough to show that the study of this insect may open up to us new views concerning the intelligence of a lowly form of life.

SOME ASPECTS OF THE FORESTRY PROBLEM IN PENNSYLVANIA.

BY DR. J. T. ROTHROCK, *State Forestry Commissioner, West Chester, Pa.*

Nothing is clearer than that henceforth forestry ideas and practice will hold an important place in our country. The period of destruction of wood land has not passed, nor indeed can it ever pass; but plans of restoration are abroad, and it will be but a brief period before individuals, corporations, and probably the State, will begin systematic attempts at replanting.

The present seems like a suitable time to call attention to certain points in connection with this work.

One of the most important factors in this problem presents itself to owners of cleared lands which have become worn out by tillage.

There is in the State of Pennsylvania, an enormous acreage of such. Steep hillsides, especially, are apt, if the soil is made up of disintegrated shale, to deteriorate very rapidly. There is, of course, a two-fold reason for this: First, the inclination, and second, the absence of a dense retaining sod. With every dash of rain the elements of plant growth are carried to the lower levels and off of the field. It may be fairly asked whether, in the present condition of agriculture, it pays to attempt farming soil of this kind. Indeed, it may be asked—whether it ever did pay to farm it? Would not more attention given to fewer acres have produced larger results? It may be stated as an axiom, that land under cultivation tends to become poorer. Instances are known of virgin western soil producing fifty bushels of wheat to the acre; but how many such yields as this can be shown on fields which have been long tilled?

We claim that it would be wise to give up a large portion of these steep hillsides at once to native trees. It is quite true that the impoverished condition of the soil would result in tardy growth, even of these trees. But the two leading facts of the case are, that it does not, as a rule, pay to farm such land as I have described, and that the soil is becoming poorer the longer the attempt is made. The proposition seems to be a plain one then—plant unremunerative, steep hillsides in trees, even if you have to furnish a start by fertilizing a foothold for the trees.

It would be out of place here to indicate just what specimens should be planted. On such spots, as a rule, probably nothing would bring a return quicker than locust or chestnut. The white pine, if in a soil and region adapted to it, is of easy growth and promises large future results. But bear in mind when you think of the long time which must elapse before your trees yield anything, that it would probably be a longer time before the soil I am writing of will yield you anything else.

There is, I think I may say, a peculiarity of our American forests—their rapid growth. It will probably be a liberal estimate to say that 50 cubic feet yearly, per acre, would be a large yield for a German or other European forest. Yet there are not wanting instances here where land owners count on 100 feet annually, at least. Their estimates, and observations, too, seem well founded from a long and large practical experience. On the other hand, there are some who have run this idea quite too far. It is mischievous to assert that our trees can be counted on to mature in fifty years. No pine, or oak, or hickory, or ash, which are our most important trees, will do so. It is a comparative loss to cut them at that age. And unless it be second growth from a vigorous stump the timber is apt to be of inferior quality. Fifty years will seldom produce a normally tall white pine with a stump of over 18 inches in diameter. This statement is a result of many counts made in different parts of the white pine belt in this State. Furthermore, take a chestnut forest (not an isolated chestnut tree), and fifty years will produce first class telegraph poles, but not a strictly well matured timber.

In such trees as white pine, the year's growth at fifty years is usually still quite large. The decrease in size of these annual rings does not begin until much later. And it must be remembered that one-eighth, or a quarter of an inch increase in size around a stump of 18 inches diameter means the formation of much more wood than if the stump

were but half that diameter. Hence my statement that to cut a tree of this kind at such an early period is a relative loss, for the simple reason that then the tree is in the most productive period of its life. The same is measurably true of other kinds of trees, excepting that in the oak, the period of greatest productiveness is apt to end before the tree has attained a diameter of 18 inches.

As further bearing on this subject of spontaneous production of our native forests, I may say that the rapid restoration of saplings is often slow; for example, my attention was recently called by Prof. Buckhout to some small black oaks in Centre county, which were dying at the tops, yet they had not attained half their normal size. It was all explained, apparently, by an inspection of the locality, which revealed a bed of rock just under a thin coating of soil. This, however, was an exception, and does not in the least invalidate the general statement that our native trees grow here with a rapidity which must surprise a forester from abroad.

The object of insisting upon these points is to enforce the general proposition that our most serious enemy, especially on unseated lands, is fire. There are extensive areas in Pennsylvania, where, I am informed, that about once in three years the whole surface of the country is swept by fire. The wide views of dead, black, charred tree trunks, which are too often seen, seems to show that this statement is true. (See illustration.) It must be observed that this statement is large and small, white pine of less than a foot diameter, both chestnut, and even rock oak, are the most frequent and severe sufferers by these visitations. Pitch and yellow pine, after they are well started, are more resisting to the action of fire. Indeed, one experienced lumberman affirmed that occasional fires improve them. It would hardly be wise to act upon that idea, however.

There is, then, no more important question (and I may add, no more difficult), to answer than this—how shall the frequency and the severity of the forest fires, especially on the unseated lands of the State, be prevented?

The difficulty is not, per se, an insuperable one. Its gravity depends on lack of men and money available to restrain incendiaries, and to head off accidental conflagrations. In the present condition of public sentiment, it would be worse than useless to ask support for radical measures. Men of sense will simply ask for what they can get, and be content to make the best out of resources at command.

There are, however, certain conditions which may be changed. To illustrate: within a month, I have seen an extensive area, say 500 acres, more or less, of young white pine, which had already attained an average diameter of almost a foot at the butt, which was wholly killed by a forest fire last spring.

It is morally certain, the fire was started for the purpose of destroying underbrush in order that cattle might find pasture and browsing. Such things were done in earlier years with hardly an attempt at concealment. The fact that it is now a carefully guarded secret indicates a proper and promising change in public sentiment. But, nevertheless, it is done "in the dark o' the moon." The disparity between the damage done and the good accomplished by such firing, would be ridiculous if it were less serious.

BURNT TIMBER, SIX MILE RUN, CENTRE COUNTY, PENN'A.



were but half that diameter. Hence my statement that to cut a tree of this kind at such an early period is a relative loss, for the simple reason that then the tree is in the most productive period of its life. The same is measurably true of other kinds of trees, excepting that in the oak, the period of greatest productiveness is apt to end before the tree has attained a diameter of 18 inches.

As further bearing on this subject of spontaneous production of our native forests, I may say that the rapid restoration of saplings is amazing. On the other hand, the subsequent growth on poor land is often slow; for example, my attention was recently called by Prof. Buckhout to some small black oaks in Centre county, which were dying at the tops, yet they had not attained half their normal size. It was all explained, apparently, by an inspection of the locality, which revealed a bed of rock just under a thin coating of soil. This, however, was an exception, and does not in the least invalidate the general statement that our native trees grow here with a rapidity which must surprise a forester from abroad.

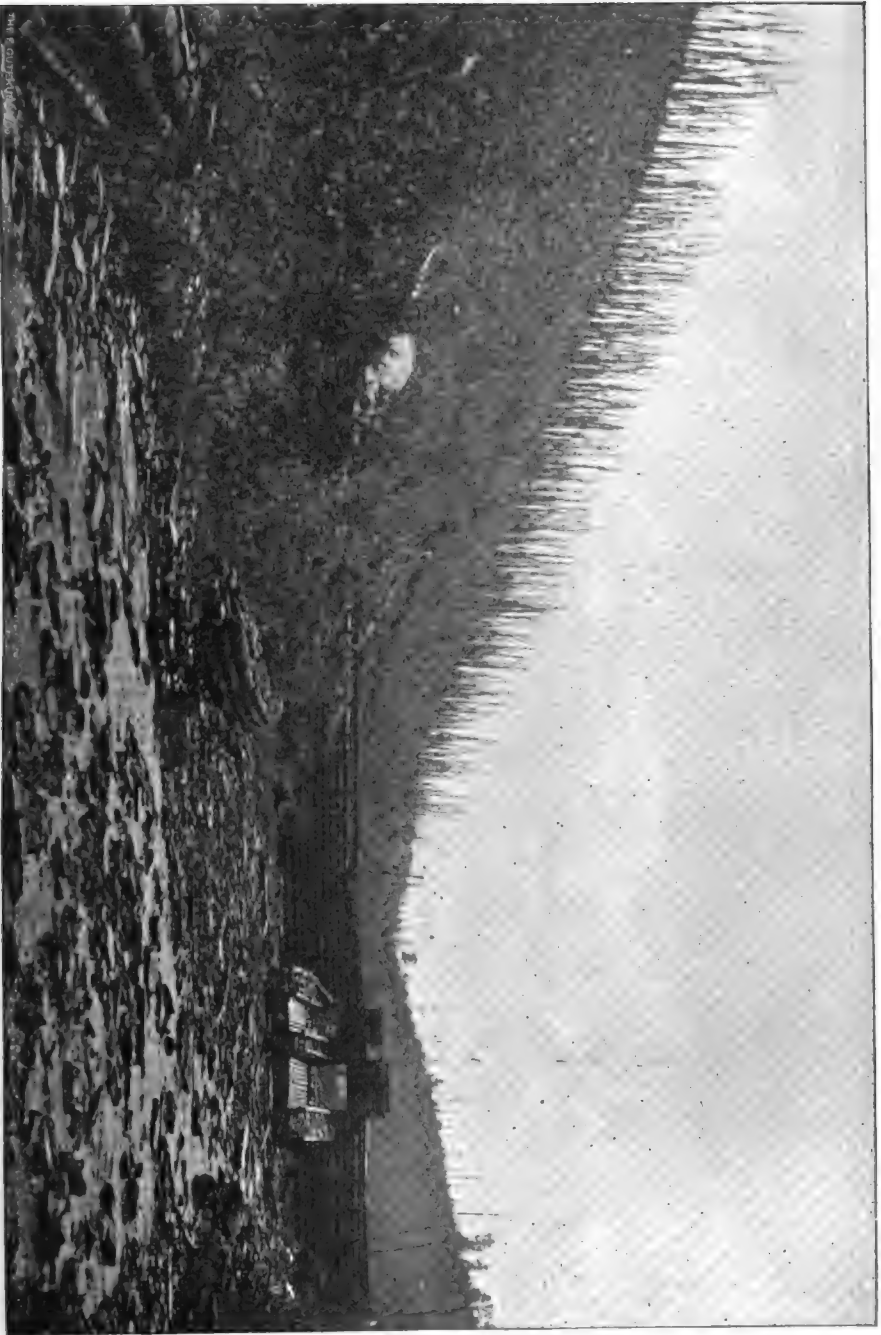
The object of insisting upon these points is to enforce the general proposition that our most serious enemy, especially on unseated lands, is fire. There are extensive areas in Pennsylvania, where, I am informed, that about once in three years the whole surface of the country is swept by fire. The wide views of dead, black, charred tree trunks, which are too often seen, seems to show that this statement is true. (See illustration.) It must be observed that hemlock, both large and small, white pine of less than a foot diameter, young chestnut, and even rock oak, are the most frequent and severe sufferers by these visitations. Pitch and yellow pine, after they are well started, are more resisting to the action of fire. Indeed, one experienced lumberman affirmed that occasional fires improve them. It would hardly be wise to act upon that idea, however.

There is, then, no more important question (and I may add, no more difficult), to answer than this—how shall the frequency and the severity of the forest fires, especially on the unseated lands of the State, be prevented?

The difficulty is not, per se, an insuperable one. Its gravity depends on lack of men and money available to restrain incendiaries, and to head off accidental conflagrations. In the present condition of public sentiment, it would be worse than useless to ask support for radical measures. Men of sense will simply ask for what they can get, and be content to make the best out of resources at command.

There are, however, certain conditions which may be changed. To illustrate: within a month, I have seen an extensive area, say 500 acres, more or less, of young white pine, which had already attained an average diameter of almost a foot at the butt, which was wholly killed by a forest fire last spring.

It is morally certain, the fire was started for the purpose of destroying underbrush in order that cattle might find pasture and browsing. Such things were done in earlier years with hardly an attempt at concealment. The fact that it is now a carefully guarded secret indicates a proper and promising change in public sentiment. But, nevertheless, it is done "in the dark o' the moon." The disparity between the damage done and the good accomplished by such firing, would be ridiculous if it were less serious.



BURNT TIMBER, SIX MILE RUN, CENTRE COUNTY, PENN'A.

The remedy for such lawlessness is clear. Simply confiscate all cattle roaming at large on unseated lands. They are themselves public enemies by the harm they work to the growing shoots, quite apart from damage done by the fires which were created in their interest.

Then, no one doubts, however difficult the proof may be, that our railroads are among the most frequent causes of forest fires. Is it within the power of the law to hold them directly responsible for a strip of unseated woodland, say of 25 feet on either side of their road-bed, unless the owner thereof will assume care of it and become responsible for the direct and the consequential damages arising out of any neglect of his to suppress the fires occurring on it? It has become a matter of public protection of such vast importance as to merit prompt and stringent action.

Another plan has been suggested by Mr. Hunter, of Centre county, i. e., to apply the tax obtained from unseated lands, specifically, to the suppression of fires in that same region. The plan has the great merit of simplicity, and of probable efficiency. There is, however, this to be said, the objection to it lies, not to its direct practical workings but in the fact that it may strike at the root of a larger and, possibly, still more important principle.

This, then, leads me to the brief consideration of the tax question, in so far as it applies to standing timber, on either seated or unseated lands.

There is no doubt that the backbone of the whole forestry difficulty will have been broken the moment we, as a people, actually come to feel that our trees are not only worth protecting, but are worth cultivating. Show the average American farmer a crop which promises to be lucrative and worth his attention, and if he fails to find a way to produce it (if suited to his surroundings), it will be a marvel which stands alone in our industrial history. For this reason it is, in my judgment, wiser to have the restoration of our forest resources made an individual, rather than a State problem. Let us, by all means, have a State reservation, or, if you prefer, two, three, or four; and let them serve as object lessons of the most approved and productive character, and let them, besides, serve as stations in which the most abstruse scientific problems of forestry shall receive due attention, by the most competent men; but, at the same time, encourage by wise legislation, the individual owners to care for their own forest property as jealously as they do their cereal crops or their buildings. Encourage neighbor to join with neighbor in suppressing fires and in arresting trespassers upon it.

To make a crop lucrative, you may either reduce the cost of production, or increase its market value. The former of these methods is one which, in my judgment, should be applied to the forests. The latter will come as a result, in time, and with consequent greater scarcity of good lumber. In other words, I am convinced that all standing timber should be absolutely exempt from taxation, providing it is of such character and quantity as to promise to be of future value. I hold this belief because I accept the established doctrine of older civilized nations, that the forests are, as a matter of fact, "more valuable to the State, even than they are to the individual," and that it is wrong to tax the owner for property which is a source of strength to the Commonwealth; and for the service which they render, he can

in the nature of the case, hardly expect to receive compensation directly. I allude here to the acknowledged efficiency of the forest areas in hoarding water.

There are, of course, objections to this, as there are to all innovations, because it must, to a certain extent, conflict with established conditions. The only question, however, that a statesman, or a liberal minded citizen will ask is, will it lead to improved conditions? We have no space here to discuss the point at length. Let it suffice to say that removal of taxes from thriving, standing timber means the removal of the premium we now place upon robbing the State of one of its most important resources. It will lead to diminishing the yearly cut, and to a consequent rise in prices, and, what is not the least in importance, to inculcation of habits of economy in use of wood, which must (and properly so) be inculcated throughout the land. It is not simply extravagant that we should use in this country per capita, from six and a-quarter to ten times as much wood as civilized men find necessary elsewhere—even where coal is less abundant than with us. It almost shameful waste!

There is no duty of the Commonwealth more obvious than the utilization, in some manner, of its entire area. We expect to double our population in the next thirty-five years, and by the end of the coming century we may anticipate that the State will already be crowded. It is, then, a fair economic problem—shall our poor, hilly acres be still more poor and unpromising, producing nothing, or shall they be restored to primitive productiveness, and also be covered with a valuable crop of timber, which will be a source of wealth to the owner and of power to the State?

The problem is not to be solved on the basis of any sentiment or whim, but should be considered wholly from the standpoint of the greatest productiveness of each individual acre. If it does not now pay to farm worn out land, will it pay any better to cultivate it when it is still more impoverished?

There is, moreover, a further consideration. Up to this point we have drawn mainly upon the matured product of our forests. There is, however, an obvious change impending. Small timber, produced by the needed process of thinning growing forests, will find new uses. Witness, for example, the wood pulp industry, and the extraction of tannin from young chestnut trees. When one considers the probable early destruction of the bulk of our hemlock forests, it can hardly be otherwise than that the demand for young chestnut must increase. Examples could be multiplied, but this must suffice.

AGRICULTURAL EXPERIMENT STATIONS.

BY DR. H. P. ARMSBY, *Director Pennsylvania Experiment Station, State College, Pa.*

It is a fact worth remembering that the history of agricultural experiment stations begins with a book. A little over a half a century ago (in 1840), Justus Liebig, Professor of Chemistry in the

University of Geissen, Germany, published a small book entitled, "Chemistry in its Applications to Agriculture and Physiology." The publication of this work marked an epoch in the history of rational agriculture. Not that other eminent scientists had not, before this time, studied and written concerning the same subject, but Liebig's book, by its clear and attractive style, by the novelty of many of the views it set forth, and, above all, by the effectiveness with which it showed the vast advantages which might accrue to agriculture from the utilization of the facts discovered by the chemist, produced a profound sensation in all agricultural circles and led to the most important results in many directions.

One important consequence of the controversy, which soon arose over Liebig's so-called "mineral theory," was the inauguration by John Bennett Lawes, in 1843, of the extensive series of field experiments at Rothamsted, in England, which has since become so celebrated. The interest aroused was not less, however, in Liebig's native land, and was strengthened by the popular lectures of Petzholdt and Stoeckhardt in Dresden and Chemnitz. By 1845, too, Liebig had induced English capitalists to engage in the manufacture of the artificial fertilizers, which were first proposed by him in his book, and the many questions arising as to the value of these fertilizers and the best method of their use, vastly increased the interest taken in agricultural investigation. A noteworthy thing, too, is that scientific investigation was generally recognized as being what was specially called for, and that, in all the proposals and petitions which were called forth, it was the chemist from whose work aid was anticipated.

Various proposals were made looking toward a popularization of Liebig's theories and towards carrying on experimental work at state expense. There was a general feeling, however, that before experimental work could be very fruitful, better opportunities must be afforded to the agricultural classes to become acquainted with what science was already able to offer them, and thus prepare themselves to understand and utilize the results of investigation. One of the first practical steps in this direction was the strengthening of the scientific side of the work of certain agricultural schools, notably that of Tharandt, where Stoeckhardt was made Professor of Agricultural Chemistry in 1847. His duties were to teach, to investigate and to lecture, in conjunction with the Professor of Agriculture. A chemical laboratory was also built for his use. His "field preaching," or familiar addresses to the farmers in all parts of Saxony, the precursor of the modern farmers' institute, was a powerful factor in increasing and popularizing the interest in agriculture.

In 1850 the Agricultural Council of Saxony recommended the appropriation of 300 thalers for carrying on field and feeding experiments. The accommodations at Tharandt were found insufficient for this work, and Dr. W. Crusius offered the use of one of his estates, which was already provided with a chemical laboratory. For some unexplained reason his liberal proposal was not accepted, but in the same year, on Oct. 19. the Leipziger Oekonomische Societat, of which Dr. Crusius was president, offered the use of its estate at Moeckern for this purpose. In addition, the society also provided a laboratory and accommodations for a chemist, while Dr. Casius personally assumed the salary of the chemist (which amounted to the magnificent sum of 300 thalers, or \$225 per year), and the necessary current ex-

penses. Under these conditions, Dr. Emil Wolff, who has been prominent in experiment station work ever since, and is well known as the author of several important works on different branches of agricultural science, came to Moeckern on the first of January, 1851, and became the first director of an experiment station.

At this time, while the beginning of an experiment station existed, it was still maintained by private generosity, and was struggling with financial difficulties. Towards the end of 1851, Wolff was made secretary of the society at a salary of 150 thalers, and in 1852 an agricultural society in Hanover gave to the Leipzig Society 800 thalers, the interest of which was to be used for the support of the new station.

On July 9, 1852, the Saxon government appropriated for the station 150 thalers for the remainder of that year, and for the next two years 350 thalers yearly, and Moeckern thus became the first public experiment station. The station was definitely organized in December of the same year as a sort of corporation, its object being stated as follows:

"To contribute to the increase of the knowledge of the art of agriculture and the related industries by means of scientific investigation in the closest connection with practical experiments of various kinds."

OTHER EUROPEAN STATIONS.

The idea thus embodied in the Moeckern Station proved a fruitful one. In the next year (1853) the second experiment station was founded, at Chemnitz. In 1855 the third one was inaugurated, and for the succeeding twenty-two years, 1860 was the only one which did not witness the founding of at least one station in Germany. Other European nations also followed the example of the German states, and stations were established by France in 1856, by Austria in 1857, by Holland in the same year, by Sweden in 1861, by Russia in 1864, by Italy in 1870, by Denmark in 1871, by Belgium and Switzerland in 1872, by Austro-Hungary in 1873, by Scotland in 1875, by Spain in 1876. At the present time there is hardly any country in the civilized world which has not one or more stations or agricultural laboratories. They are to be found in every European country except Turkey. Germany had last year 66, France 68, Austria 34, Sweden 25, Italy 18, Russia 14, Great Britain 9, Switzerland 9, Belgium 9, Holland 4, Denmark, Norway, Spain and Portugal 3 each, and Roumania 2.* In Asia Java has 4 and Japan 3, while India and other countries are agitating the question of their establishment. The English colonies in Australia have substantially the same thing under another name. Brazil has at least one station. The Dominion of Canada has one on an extensive scale, embracing five experimental farms in different sections of the Dominion, and in addition, the Province of Ontario has its own experiment station in connection with the agricultural college at Guelph. Our own country has at the present time, not counting branch stations, fifty-four, or more than any other country, except France and the German Empire.

* These statistics are taken from a compilation by Nobbie in Mentzel and v. Lengerke's "Landwirtschaftlicher Kalender" for 1893.

THE EXPERIMENT STATIONS OF THE UNITED STATES.

In the United States, Connecticut was the first state to found an experiment station. Prof. S. W. Johnson, of the Sheffield Scientific School of Yale College, had for many years carried on at that institution analyses of commercial fertilizers for the benefit of the farmers of the State, and it was largely through his labors and teachings that the experiment station idea took root in this country. The first station was founded at the Wesleyan University, at Middletown, in 1875, being supported in part by the State, in part by the University and in part by private generosity. In 1877, the station was reorganized and removed to New Haven, where it was located in the building of the Sheffield Scientific School, and in 1882 it was provided with land and buildings by the state.

The second experiment station in the United States was organized by North Carolina in 1877, being located first at the State University, at Chapel Hill, and subsequently at Raleigh. New Jersey followed the example of these two states in 1880, locating its station at the State Agricultural College, at New Brunswick. In 1882 Ohio and Massachusetts organized experiment stations.

Late in the second session of the Forty-seventh Congress, (1882) the Hon. C. C. Carpenter, of Iowa, introduced a bill, crude in form, looking toward the establishment of an experiment station at each of the Colleges of Agriculture and the Mechanic Arts established under the provisions of the so-called "Land Grant Act" of 1862. Owing to the late date of its introduction, the bill slumbered in committee, but the U. S. Department of Agriculture in co-operation with the agricultural colleges took the matter up, and after four years of hard work the "Hatch Bill," as it came to be known from the name of the Hon. W. H. Hatch, of Missouri, chairman of the Committee on Agriculture of the Forty-ninth Congress, was passed and was approved by the President, March 2, 1887. While very many persons contributed of their time and substance to aid in the passage of this far-reaching measure, it is but proper that special mention should be made of three gentlemen who were specially instrumental in securing its passage: Hon. W. H. Hatch, chairman of the Committee on Agriculture, Prof. Geo. H. Cook (since deceased), Professor of Agriculture in the New Jersey Agricultural College, and President Geo. W. Ather-ton, of the Pennsylvania State College.

The outlines of this bill are familiar to all, its essential feature being the provisions for appropriating \$15,000.00 annually to each of the so-called "Land Grant Colleges," this money to be used for establishing a department which was to be known as an "Agricultural Experiment Station," and was, in general terms, to be devoted to scientific investigation in the interest of agriculture. The result of this magnificent provision for agricultural experimentation was a rapid multiplication of stations, about twenty-five being founded in the year 1887. At the close of that year every state in the Union and the territory of Dakota had one or more, and several have since been added to the list. At the present time there is at least one station in every state and territory except Montana and Alaska.

COMPARISON OF THE UNITED STATES AND GERMANY.

It may not be without interest to compare the experiment stations

of this country, as they now exist, with the stations of Germany, which may be regarded as the native land of experiment stations, and which is, moreover, the one for which we have the most complete statistics:

	German Empire.	United States.
Number of stations,.....	66	54
Number of officers and assistants,.....	253	491
Average number of officers and assistants, per station,.....	3.83	9.09
Average income per station from all sources, (a) \$5,869	(b) \$18,816	
Average value of additions to equipment in 1892,		\$2,185
Total population,	45,000,000	62,622,250
Population per station,	681,818	1,159,671
Total area, square miles,.....	212,028	2,900,170
Square miles per station,	3,213	53,707
Population per station worker,	177,866	127,540

In proportion to its area, Germany has nearly seventeen times as many stations as the United States. If we take account of the relative density of population, however, and compute the number of inhabitants per station, we find that Germany has relatively only 1.7 times as many stations as the United States. But while Germany has relatively more stations, its stations employ on the average a less number of workers, the American stations having about two and one-third times as many per station. It follows from this, therefore, that our country has a little over 1.4 times as many experimenters at work in proportion to its population, as has the German Empire. Our figures make it appear, too, that the average income of the American station is over three times that of the average German station. This is not a fair comparison, however, because a considerable proportion of the workers in the German stations receive their salaries from other affiliated institutions and not from the station funds.

The amounts expended by the United States and state governments in this country in aid of agricultural investigation make an imposing total. According to the last report of the Secretary of Agriculture, these amounts in 1892 were as follows:

United States Department of Agriculture,*.....	\$1,495,400
United States Department of Agriculture, printing re- ports,	400,000
Agricultural Experiment Stations, United States appro- priations,	689,542
Agricultural Experiment Stations, State and other ap- propriations,	307,702
Total,	<u>\$2,892,644</u>

I am certainly speaking within bounds in designating this as the most magnificent public provision for agricultural experimentation which the world has yet seen.

(a) Average of 36 stations for 1892.

(b) Average of 53 stations for 1892.

* Exclusive of \$889,753.50 for the Weather Bureau.

THE WORK OF THE EXPERIMENT STATIONS.

The work of the agricultural experiment stations of the world covers a very broad field. Hardly a branch of agricultural production, or of technology related to agriculture, can be named which has not one or more stations devoted to it. As a matter of necessity the stations have specialized their work. The field of agricultural investigation is so vast that no station can hope to cover it all, and as the stations have developed in different regions they have occupied such portions of this vast field as promised to yield results of the greatest benefit to their own locality. This is especially true of the older experiment stations of Europe, both because they are older and because their incomes are, as a rule, smaller than those of our stations.

The limits of this article do not permit even a summary statement of the various lines of work carried on at the different stations.* One broad classification of the work of the stations may, however, be made, namely: Technical and scientific, or what is often loosely called "practical" and "theoretical." By technical work I mean experimental work which has for its object to show how the known principles of agricultural science may be applied to conditions actually existing in the agriculture of a particular region. In brief, it is an endeavor to find out how best to use what we already know.

By scientific work, I mean experimental work devoted primarily to the discovery of new principles and laws, and having no immediate relation to the application of these principles in practice. The statement which I quoted a few moments ago of the objects of the first German experiment station, illustrates the fact that this station aimed at first to combine both lines of work. At present European stations devote themselves largely to scientific work on the one hand and to police duty, such as the analysis of fertilizers, feeding stuffs, etc., on the other. Their work is largely laboratory work, either chemical or physiological, and few of them have farms.

The American stations have started out with much the same general idea as the German stations. All, I think, have farms or the use of portions of farms. An acute German observer, who recently visited this country, says that they are experimental estates, rather than experiment stations in the German sense. What the future development of our stations will be can hardly be predicted as yet. I do not, however, altogether share the views of those who think that they will develop as European stations have—into institutions devoted largely to scientific research. I think the stations ought to do more scientific work. They ought not to content themselves with simply teaching their constituents how best to use such knowledge as we already have, but they should be sources of new light and new inspiration to students of agriculture. At the same time, the peculiar conditions under which they now exist, and the liberality with which they have been endowed, give them a great opportunity for what I have called technical work; an opportunity which the European sta-

* Those who are interested in pursuing this branch of the subject further will find quite full statistics in the report of the Office of Experiment Stations of the Department of Agriculture for 1892, and in the Experiment Station Record, Vol. I, pp. 175, 245; Vol. II, pp. 310, 385, 700; Vol. III, pp. 73, 278, 440; Vol. IV, pp. 325, 879.

tions have never had, and an opportunity which should be, and, I believe, will be abundantly utilized.

It cannot be my purpose in this brief paper to outline in detail what this work should be. Suffice it to say that there is a whole line of experimentation which, on the one hand, cannot be carried out upon a farm or by a farmer and which, on the other hand, it is equally impossible to carry out at a station which has facilities only for laboratory work. Our American stations are fortunate in combining these two things—the farm and the laboratory—and if they are wise they will not fail to seize this opportunity.

Another important and, to some extent, peculiar feature of our American stations, is their connection with educational institutions. In speaking of the measures which preceded the organization of the first experiment station in Germany, I mentioned the need that was then felt for additional educational facilities, as well as additional facilities for investigation, and that the first practical step taken was to make provisions for both these needs at the Agricultural School at Tharandt. The same situation exists, to a degree, in this country to-day. The American farmer is not uneducated, but he has not usually had much opportunity to acquire this particular kind of education. As a consequence of this fact, he is frequently not in a position to fully comprehend the importance of the experimental results which are reported to him, or their relations to what he already knows. He needs the aid of both the agricultural college and the agricultural experiment station, and the work of each supplements that of the other, the educational work serving to explain and render more easily comprehensible the results of experiments and the experimental work, vitalizing the knowledge imparted by the college and indicating the directions in which it is advancing. The two kinds of work are the two halves of a whole. Education and experimentation must go hand in hand if either is to accomplish the best results.

THE PENNSYLVANIA EXPERIMENT STATION.

Pennsylvania was one of the first of the states to enter the field of agricultural experimentation. Experiments of one sort or another in the interests of agriculture have been in progress at the Pennsylvania State College since 1859, or for the past thirty-four years. In the earlier periods of the growth of the institution, these experiments were of necessity somewhat crude and scattering. In 1867 the State provided for the purchase of three experimental farms, which were bought during the succeeding two years. Since then, in one form or another, a large amount of experimental work has been carried on. I have recently had occasion to make a tabulation of the experiments made at the college since 1869, and, while I had already some familiarity with the work, I confess that I was astonished at its amount and variety.

The organization of the experiment station dates from 1887, when the "Hatch Act" enabled a greatly increased equipment to be provided and allowed the work to be very considerably expanded. This expansion of the work has taken the direction of more thorough and elaborate experiments whose results are more carefully checked and controlled, rather than the making of a greater number of experiments, and has been largely in the direction of experiments in stock feeding

and dairying. Since the organization of the station, the State has appropriated to it in all \$19,000.00, all of which, together with a not inconsiderable amount realized from sales of produce, has been devoted to increasing the material equipment of the station. In 1889, by action of the State Board of Agriculture, the analysis of commercial fertilizers, which had up to that time been executed by private parties, was transferred to the station, so that it now co-operates with the Board of Agriculture in the police duties involved in an examination of the commercial fertilizers sold in the State.

I think I may say, without boasting, that the station is one of the best equipped in the country. In 1892 it stood fourth in the list as regards its current income. As to its work, that must speak for itself. No statement that any officer of the station can make regarding it can make it either better or worse. I can only say it is to be had for the asking in the publications of the station, which are sent free of charge to every citizen of the State requesting them.

Along with its experimental work, the institution has not been unmindful of the fact, to which I have already called attention, that teaching and experimenting are two halves of a whole. Moreover, in the educational work of the college, as in its experimental work, it is our aim to go to the farmer rather than to wait for the farmer to come to us. We maintain a four years' course in agriculture of collegiate grade and leading to exactly the same degree as the other technical courses of the college. It is the general experience, however, not merely at this college, but all over the country, that not very many farmers' sons desire a course of this character, though we have never, of late years at least, been without students in this course. I think it unquestionably true, however, that for the present the needs of the farmer will be best served in the majority of cases, and his financial condition best met, by shorter and simpler courses. This need we are attempting to supply along three different lines:

First, we have what is called "A Short Course in Agriculture," a twelve weeks' course of lectures given in the winter, intended to be general in its character and to cover in outline the most important branches of agriculture and agricultural science.

Second, we have a special course in dairying, which is intended to be the precursor of other special courses. In this course, the instruction is confined chiefly to the particular subject of dairying, and covers this quite thoroughly, embracing both class room instruction in the principles of dairying, laboratory exercises in milk testing, etc., and actual practical work in the creamery in the manufacture of butter by the most approved modern methods.

Third, recognizing the fact that after all, the majority of farmers' children cannot avail themselves of either of these courses, we have initiated a course of home reading in agriculture upon the well known Chatauqua plan, by which we hope to be able to bring some of the benefits of the agricultural college to every farmer's home in Pennsylvania. Space does not permit a full description of these courses, and I mention them here mainly to show that we are not neglecting this important side of our work.

PEACH YELLOWS.

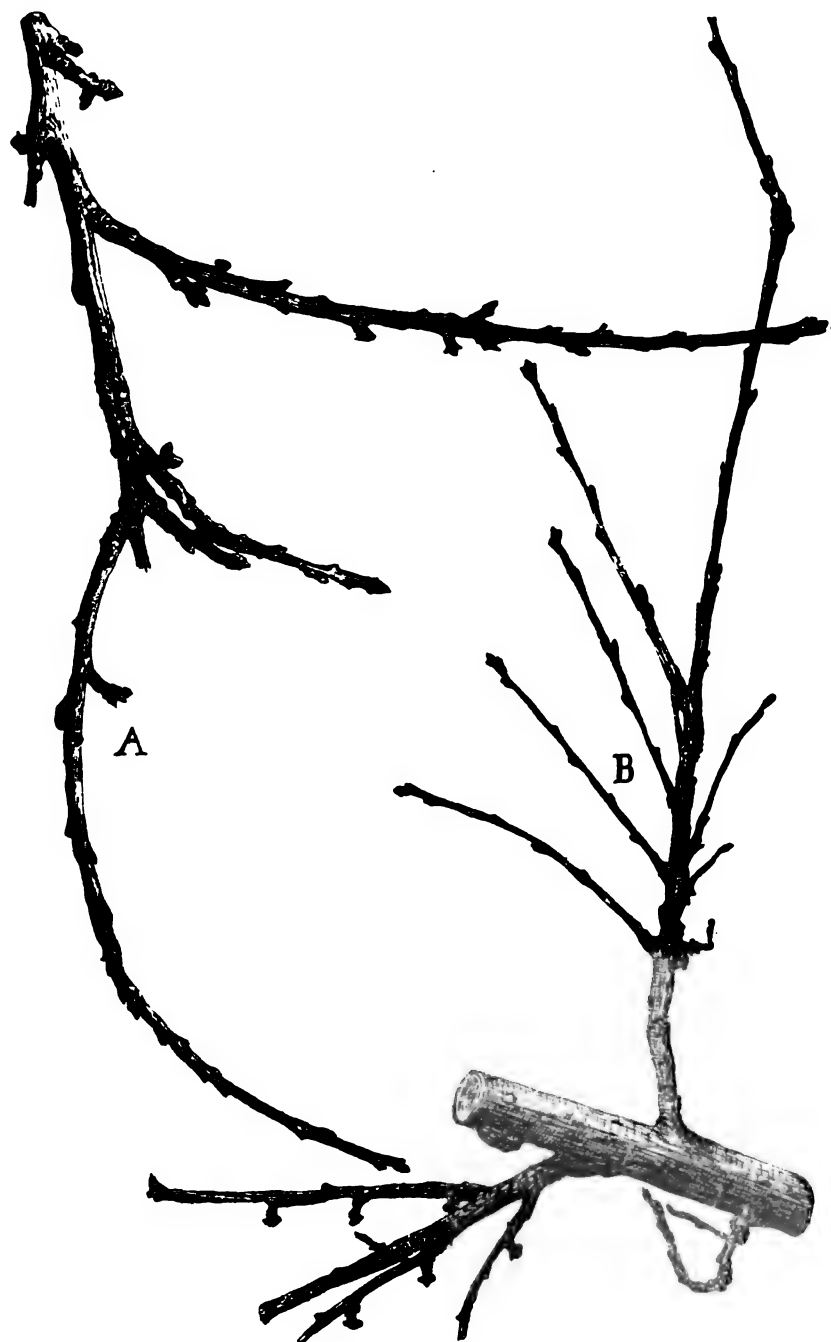
BY PROF. GEO. C. BUTZ, *State College, Pennsylvania.*

Since the enactment of the law by the Legislature of Pennsylvania in 1891, making it the duty of every citizen of this State to destroy all trees and fruit known to be affected with the disease called "peach yellows," the enforcement of the law seems to have been obstructed by a lack of familiarity with the symptoms of the disease on the part of citizens from whom the proper commissioners should be chosen, to condemn the suspected trees or fruit. It is proposed here, therefore, to present, in a brief manner, a summary of the nature, effects, and symptoms, so far as known, of this mysterious and destructive disease that has baffled the ingenuity of specialists in fruit culture, and in vegetable pathology.

Dr. Erwin F. Smith has been working for more than six years as the special agent of the Department of Agriculture, Washington, D. C., upon this disease, and in his reports of 1888, 1891, and 1893, has produced an abundance of evidence that destroys every theory yet advanced in regard to the cause of the yellows, and settles beyond dispute many facts which had been conjectured about it. The substance of this review is gathered largely from these researches. After all, however, it is probable that the knowledge of the exact cause will afford no new weapon to use against this terrible foe to peach culture. The only certain method of destroying the disease is by the destruction of all the affected trees, and whereas, by the neglect of one man to exterminate the contagion, his neighbors must suffer, therefore, such neglect should be considered a punishable offence, and is made an offence against the law by the States of Michigan, New York and Pennsylvania; also Ontario.

THE NATURE OF THE DISEASE.

Peach yellows is a disease known only in Ontario, Canada, and the United States, and even here has not yet been discovered west of the Mississippi river. The earliest reference by the name of "yellows" was made by Judge Richard Peters, of Philadelphia, in a paper on "Peach Trees," read before the Philadelphia Society for Promoting Agriculture, February 11, 1806. From this time forward, reports became more and more frequent, and successively from regions more and more remote from Philadelphia, until to-day we find it so prevalent in many of the eastern states that peach growing, as an industry, is being abandoned, because of the unprofitableness due to the early death of trees by the yellows. In a given orchard the disease does not regularly attack one tree and spread consecutively to the others, but may, and generally does, appear anywhere, as if choosing the most susceptible trees. When the yellows takes hold of a tree the entire tree is finally affected, although it may show itself prominently only in a branch of the tree the first year. It commonly attacks bearing trees in their prime of life; that is, between six and fifteen years old, although instances are found in which young orchards were invaded before bearing, and, on the other hand, old orchards in which the trees



A. WINTER BRANCH FROM HEALTHY TREE. October 20, 1898.
B. WINTER BRANCH FROM DISEASED TREE. " "

were attacked at the age of 20 to 30 years. A diseased tree rarely dies the first or second year of its attack and may linger through three or four years, but is worthless from the beginning for the production of fruit, and beyond the hope of recovery by so-called remedies. These, by the way, have not been lacking, as is indicated by the following extract from Dr. Smith's researches of 1888: "There is no end to so-called remedies. If we may believe published statements peach yellows has been cured by stable manure, urine, house slops, lime, gas lime, wood ashes, potash, chlorate of potash, saltpetre, ground bone, bone black, hot lye, hot soap, hot water, fish brine, fish compost, and various other commercial fertilizers, especially those compounded of muriate of potash and dissolved bone black, and sold under the name of 'peach tree fertilizer,' or 'peach yellows remedy.' Some manufacturers have also advertised such fertilizers as possessing the property of germicides. All such statements are false and misleading and are not made in the interest of peach growers."

The yellows is essentially an enemy of the peach, but is known to attack also nectarines, almonds and apricots. It does not attack the plum, and therefore, many years ago, the thought occurred that peaches budded on plum stocks might be free from the yellows, although direct evidence on this point has proved the contrary to be true. The case cited by Noyes Darling, in an orchard of Connecticut, is the most direct. A considerable number of peach and nectarine trees, budded on plum stocks, were procured from England and planted where no peaches had been grown for twenty years. These trees appeared in perfect health the first season; some showed symptoms of the yellows the second season and died in the third season. This, and similar evidence adduced by Dr. Smith, tends to disprove the theories that some underground parasite or root fungus is the cause of the yellows.

There is considerable testimony to the effect that healthy trees, planted immediately in the places where diseased trees have died, are no more subject to the yellows than other trees in the orchard. The disease is contagious. This has been abundantly proved by successful innoculations through the medium of buds taken from diseased trees and inserted into healthy young trees.

Many theories have been advanced from time to time as to the cause and conditions which serve to bring about the yellows disease. These theories, however, need but little attention here. Changed conditions in our climate, soils exhausted of their fertility, neglect of cultivation and pruning, degeneracy of vitality due to continued propagation by budding, mechanical injuries caused by insects and other means, debility caused by certain parasitic fungi—these are the names under which all the theories may be classed. Out of these, one theory advanced and corroborated by such men of high scientific and experimental attainments as Goessman, Penhallow, Fuller, Hale, and others, on the supposition that infertility of soil causes yellows, which can be cured and prevented by proper fertilization, was most carefully investigated and extensively tried in the orchards of Dr. Smith. The results of this work are published in bulletin No. 4 of the Division of Vegetable Pathology, United States Department of Agriculture, and may be briefly summarized as follows: Experiments with fertilizers were conducted upon 15 orchards, aggregating more than 16,000 peach trees, representing a variety of soils, using as fertilizers, guano,

dried blood, super-phosphates, and salts of potash and nitrogen, and carried on through four consecutive years. About 645 trees were diseased at the beginning of the experiments, none of them recovered, only a few of them improved to the extent of developing greener foliage and making more growth than the untreated neighbors, thus leading to the conclusion that peach yellows cannot be cured by such fertilization. About 3,800 trees were subjected to various kinds of preventive treatment. Being entirely healthy in the beginning, at the end of four years, 2,368 trees, over 60 per cent., were diseased, with no satisfaction of a gain over a similar lot of trees untreated.

With so much negative evidence about the peach yellows and its cures, we are forced to use the axe and fire to ward off this invisible foe. We must learn to know its footprints, and allow it no residence on our property, and appeal to all our neighbors for help.

SYMPTOMS.

Usually the first indication of the presence of the yellows in a tree, is the premature ripening of its fruit. The proper time of ripening for a given variety of peach in a given locality may be considered as a fixed date, and the orchardist calculates with great confidence upon the time when he must be prepared to market this or that variety. If, however, the disease has found its way into a tree, he is surprised to find his peaches strongly colored, soft, and ready to drop fully two weeks before the expected date. This period is, however, variable, and may be anywhere from a few days to six or eight weeks in advance of the normal time of ripening. As this condition of the fruit should be the signal of danger to the peach grower, and warrants the most extreme measures, a more detailed description of the affected fruit is permissible, and that of Dr. Smith is here quoted in full: "These prematurely ripened peaches differ from healthy ones very materially in color. Once seen they can never be mistaken. Generally they have more color than healthy peaches, but the essential difference lies less in the amount of color than in the peculiarity of its distribution. Instead of being delicately punctured with minute crimson dots or imbued with uniform masses of color like the ruddy cheek of a healthy peach, the surface is closely blotched with red and purple spots of variable diameter, but usually not less than one-sixteenth of an inch across. These give to the peach a mottled or speckled appearance, unlike that produced by any other disease, and so entirely different from the healthy appearance that the yellows might, in many cases, be diagnosed from a very small fragment of the skin of a single peach. Sometimes these spots are infrequent, sometimes they are very numerous. Usually they are somewhat sharply defined on a much lighter background, but sometimes they coalesce, giving to the whole peach a dark crimson or purple color, or, more rarely, a brown-purple or dull red. These red or purple discolorations are not confined to the skin of the peach, but extend into its flesh, appearing on tangential sections as roundish crimson spots, and on radial sections as more or less irregular dots, streaks, splashes or veins of color. These streaks extend entirely through the flesh from pit to skin, or only part way in or out. * * * The taste of peaches ripened prematurely by this disease varies considerably; usually they are insipid and worthless for eating."



FIG. 1



FIG. 2

FIG. 1. FROM HEALTHY TREE JUNE 22 1893

FIG. 2. FROM TREE DISEASED WITH YELLOWS IN
THE 3RD YEAR OF ITS ATTACK JUNE 22 1893.

This diseased fruit is usually smaller than its normal size, but if the tree has been previously healthy the fruit may attain full size and in such a case, too, the foliage may be perfectly normal and healthy appearing as in Figure 1, and the yellow, dwarfed foliage will appear the next season.

We may find symptoms of the disease in the growth of the tree during the latter part of the first season. These symptoms manifest themselves in the unusual development of the little shoots at the interior portion of the tree-top along the larger limbs. These shoots are always sickly in appearance, the twigs being very slender, three to fifteen inches long, and more or less tufted with the slender and small foliage as indicated in Figure 2.*

During the winter, diseased trees may be detected by the feeble twigs projecting from larger limbs, singly, or in broom-like bunches. Plate B shows the depauperate branchlets from a tree in the third year of its attack, taken after the leaves have fallen; the bark has a sickly color and the buds in the axils of leaves exceedingly small, with evidently not sufficient strength to carry them through the winter safely.

The foliage has a sickly yellow color and never a healthy green; the buds are small, and frequently during the growing season they develop immediately into starved side shoots. Comparing branch A with branch B, figured in plate 2, the remarkable difference between sickly and healthy wood will be observed. The sickly wood is totally unprepared for the winter and usually dies, so that the following year we may find on the tree much material like that represented in Figure 2, which represents the disease in its third year.

In the spring, just before the buds of healthy trees are expected to burst, the buds in those trees touched with yellows will have started several days in advance of the healthy trees. The peach grower can detect in this way to a certainty, every tree in his orchard that will develop other symptoms of yellows during the ensuing year. The blossoms are likely to come out prematurely, and, in some cases, their bursting out in the autumn seems to have been caused by this disease. These early spring symptoms are most marked on trees diseased only in a few branches.

DISEASES MISTAKEN FOR YELLOWS.

In looking for symptoms of the yellows it is necessary to be prepared to detect similar symptoms that may be due to other and well known causes. Peach trees may appear sickly, showing a yellow, curled foliage, weak growth, and even premature fruit, from several well defined causes, and a person not an expert is very likely to jump at the conclusion that it is the yellows; and, on the other hand, a person suspected of having trees affected with yellows might clear himself by proving that the symptoms are not the true symptoms of the yellows. A little careful observation is sufficient to detect the essential differences.

The effect of the working of the peach tree borer (*aeigeria exitiosa*.—Say.) is to turn the foliage yellow and make the leaves curl up, and to ripen the fruit prematurely, but it is not difficult to find the cause

* The illustrations for this article are original, from photographs.

of the trouble at the base of the trunk of the tree. A gummy exudation at this point usually indicates the presence of the borer, which may be secured by cutting away the bark, following the course of the freshly made burrow, which generally tends toward the roots, until the larva is found. This is a soft whitish caterpillar with a reddish brown head and sixteen legs. Various sizes may be found in the roots at almost any season of the year. The leaves yellowed by borers differ from those of the yellows disease in that the former will drop freely from the tree in July or August, if the tree is shaken, while the latter cling firmly until very late in the season. No excitement of growth from buds late in the season peculiar to the yellows is observed. The fruit, when ripened prematurely by the borer, does not have the unusual coloring by spots on the surface and streaks in the flesh, and possesses its proper flavor. Therefore, ripening ahead of time on the same principle that the apple ripens when attacked by the codlin moth larva, the yellows and the borer may both be present in a tree at the same time.

The black peach aphid (*A. persica niger*) occurs particularly in the sandy regions of New Jersey, infesting the roots of the peach and often in such large numbers as to dwarf or entirely kill the trees. The effect has been erroneously attributed to the yellows, but no symptoms of the yellows are present.

It is a very common sight to see trees that were planted in cold, moist soils, or those in very dry, sandy places, with a sickly yellowish foliage. Such cases are easily explained and can scarcely be mistaken for cases of the yellows, if the character of the wood and bud growths be carefully examined.

A fungus disease of the peach foliage is the "curl" or "leaf curl" (*taphrina deformans*).—Tul., written also *exoascus deformans*), more or less prevalent wherever peaches are grown, on the Eastern continent, as well as in America. It manifests itself during leaf formation, causing a distortion and thickening of the leaves, which may also turn yellow or red in color and soon drop from or are useless to the tree. It most commonly occurs with neglected culture.

REMEDY.

As early as 1828, William Prince, a famous nurseryman and writer on horticultural topics, recommended the destruction of the trees in these, his own words: "As soon as the tree is discovered to possess the characteristics of the disease (yellows), which is generally known by the leaves putting on a sickly yellow appearance—but of which the premature ripening of the fruit is decisive proof—it should be marked, so as to be removed the ensuing autumn, which must be done without fail, for if left again to bloom it would impart the disease to many others in the vicinity. * * * If your neighbor has trees infected with the yellows in a quarter contiguous to yours, it will be necessary to prevail on him to remove them."

This advice can scarcely be improved upon to-day, after sixty-five more years of experience, experiment and exasperation. We have already noted the long list of "remedies," which we are told it would be better for us to use as so much fuel to hasten the burning of the heaps of diseased wood from the orchards. Among the later experiments of Dr. Smith are those to determine if the cutting out of a diseased branch from a tree will save the rest of the tree.

In a Delaware orchard, set six years, 19 trees were selected, having one or two diseased limbs and a larger section of apparently healthy material. The diseased wood was cut out, sacrificing much healthy wood to make certain of the excision of affected material. This was done in September, and in August of the following year the trees were again examined and the disease was present in every tree thus treated, or 100 per cent., whereas, only 12 per cent. of new cases appeared in the orchard. It is beyond our purposes here to multiply such evidence as we are seeking only to emphasize the peculiarities of this dreadful disease, and to commend the spirit of the yellows law, appended to this article. It is true, the law itself will not destroy the diseased trees, and everything depends upon every good citizen of the State, who is in any degree interested in peaches and peach trees, to hold his axe, as it were, in readiness to destroy every tree in his care at the first appearance of the disease, and not wait until he has blasted his neighbor's, along with his own, hope of ever having another peach grown within the reach of his eye and hand. Although Michigan has had her law since 1875, very few cases of neglect have been punished under such direction. Nevertheless, a commendable spirit invaded the citizens of the great peach section of that State, and the work of destruction of diseased trees goes on without the thought of compulsion and a very favorable and marked effect has been reported from this practice. How to reach the negligent and indifferent people, to obtain like results in Pennsylvania, is a problem difficult to solve.

REPORTS OF COMMITTEES.

REPORT OF THE COMMITTEE ON FORESTS AND FORESTRY.

By DR. W. S. ROLAND, *Chairman, York, Pa.*

Your Committee on Forests and Forestry, in making this, their eleventh annual report, believe that the present is a proper time for a retrospective view of their work in the furtherance of the interests of forestry.

Of the Committee on Forestry appointed by your Board in 1882, but two are now members of the Committee; three of the eight are deceased, and others have lost their membership by the election of successors. The first report of this Committee occupied ten printed pages in your annual report; it covered nearly every point of the forestry question then prominent, and, among other items, contained definite information upon the following items:

1. An estimate of the amount of timber land in each county in our State.
2. The amount of young timber growing up to replace that which had been removed, or which was old enough for use.
3. The kinds which were best adapted to each county in the State, and which were found most abundant.

4. The kinds most in demand in each county.
5. The kind of soil best adapted to the growth of each kind of timber, as shown by their natural selection.
6. The question of the profit of timber growing in each county in the State, with the views of correspondents in relation to the question of general profit.
7. The best protection to forest fires, and the reports on the more common causes of forest fires.
8. The character of legislation needed to check forest fires, and to encourage the preservation of timber.
9. Extracts from the correspondence of the Committee, showing, from nearly every county in the State, the views of leading men in relation to the several phases of the forestry problem, and
10. The discussions at the meetings of your Board, after the reading of the report of this Committee.

The preparation for this report involved a large amount of correspondence, and the friends of the cause responded nobly to the call of the Committee, thus enabling us to make our report a complete compendium of what was then known or thought of in relation to the general character of the problem of forestry. This report has since been largely quoted, and its information made the basis of much of the legislation relating to forests, which is now upon our statute books.

Since 1882 your Committee has made annual reports, each year incorporating in their report such suggestions and information as its members had been able to obtain by observation and correspondence, and there can be little doubt but that our work, assisted by that of your Board, has done much to awaken the interest and stimulate the attention which has given us the wise forestry legislation of the last session of our Legislature. The suggestions of your Committee, in relation to forest fires and their prevention, exemption of timber land from taxation, and the appointment of a regularly paid Forestry Commission, have all received the attention of the Legislature, and are now, in some form or other, incorporated into the laws of our State.

The Committee has long advocated the theory that the many phases of the forestry problem could be best studied by a paid commission of experts who could devote their whole time to the collection and collation of reliable data. The main difficulty in the way of practical legislation has been the want of reliable and practical information upon which such legislation could be founded. The enactment of laws in the absence of this information, could at best be but a leap in the dark, and your Committee was, from the first, convinced that what was most needed was the appointment of a commission which should be so situated as to appropriations, as to be able to carefully investigate the matter and make a report to the Legislature, and that upon the facts presented in this report, proper legislation could be based. We have always held that the forestry interests of Pennsylvania, both economical and climatic, were of such importance that we could well afford the expenditure involved in such a work.

After eleven years of the advocacy of this belief, your Committee takes pride in reporting that largely through the influence of your Board, and the information presented by its reports, a commission has been authorized by an act of the Legislature, and an appropriation made for their expenses, and that during the past year this Commis-

sion has, by active work in the timber lands of several counties of the State, collected a large amount of valuable and practical information, which, in due time, will be given to the Legislature in their report; and we have faith that the Legislature of 1895 will be able to take the initiatory steps which shall place our State in the foremost rank in the preservation and care of her timber lands and forests.

By the almost unanimous vote of the Legislature the following act was placed upon the statute books of our State, it having received the endorsement of our worthy President, whose interest in this and other items which pertain to the welfare of our State, are so well known. The act appointing the Commission is as follows:

AN ACT

Relative to a Forestry Commission, and providing for the expenses thereof.

Section 1. *Be it enacted, etc.,* That the Governor be authorized to appoint two persons as a Commission, one of whom is to be a competent engineer, one a botanist, practically acquainted with the forest trees of the Commonwealth, whose duty it shall be to examine and report upon the conditions of the slopes and summits of the important water sheds of the State, for the purpose of determining how far the presence or absence of the forest cover may be influential in producing high and low water stages in the various river basins, and to report how much timber remains standing of such kinds as have special commercial value, how much there is of each kind, as well, also, as to indicate the part or parts of the State where each grows naturally, and what measures, if any, are being taken to secure a supply of timber for the future. It shall be further the duty of said Commission to suggest such measures in this connection as have been found of practical service elsewhere, in maintaining a proper timber supply, and to ascertain, as nearly as is practicable, what proportion of the State not now recognized as mineral land is unfit for remunerative agriculture and could with advantage be devoted to the growth of trees.

Section 2. The said Commission shall also ascertain what wild lands, if any, now belong to the Commonwealth, their extent, character and location, and report the same, together with a statement of what part or parts of such land would be suitable for a State forestry reserve; and further, should the lands belonging to the Commonwealth be insufficient for such purposes, then to ascertain and report what other suitable lands there may be within the State, their extent, character and value. The final report of the said Commission shall be presented to the Legislature not later than March 15, 1895.

Section 3. The said Commission shall have power to appoint one competent person to act as statistician, whose duties shall be to compile the statistics collected by said Commission, under their direction and supervision, whose salary shall be \$1,000 per annum, with necessary expenses, to be paid in the same manner as is hereinafter provided for the payment of the Forestry Commission.

Section 4. The Commissioners appointed hereunder shall be entitled to receive, by quarterly payments, a compensation as follows: The engineer, \$2,500 per annum; the botanist \$2,500 per annum, with necessary expenses for each, and the sum of \$20,000, or so much as is

necessary, is hereby appropriated out of any money in the Treasury not otherwise appropriated, to be paid by warrant drawn by the Auditor General.

Approved May 23, 1893.

Under the authority of the Act, Governor Pattison has appointed Dr. J. T. Rothrock and W. F. Shunk, Esq., members of the State Forestry Commission, and during the past summer they have been actively at work, passing much of the time in traveling over the counties of our State, accumulating a mass of data and information which, when prepared for publication will give information which, we are confident, has not been exceeded by any other State in the Union; and we are satisfied that the Commission, in their report to the Legislature, will be able to present a mass of condensed data which will furnish a reliable basis for practical forestry legislation in the future.

Dr. Rothrock, in referring to the forestry data obtained during the past year, writes thus:

"The past year has been, in more senses than one, most important for the forestry interests of the State. By the creation of a Forestry Commission, the State has shown, first, its interest in the cause, and, second, a determination to keep pace with the most advanced State of the Union, and the element of continued prosperity.

The lumbering interests have never before been so thoroughly in touch with the promoters of the forestry movement. The agricultural interests of the State are, if possible, more closely identified with it than ever before. So that we may justly hope that the era of forest restoration and protection is close at hand.

Forest fires have been of more than usual severity in portions of the State. It seems on the whole, however, that they have been more promptly suppressed than usual, but, notwithstanding this, large areas in the central part of the State show by the freshly blackened trunks, the destruction of many acres of valuable young chestnut, pine and hemlock timber. Some instances are doubly unfortunate, because the fires were, in all probability, started for the purpose of creating browsing for small herds of cattle. Such destruction is criminal and merits the most prompt and most severe action of the law.

A foe, not new, but more active than usual, has invaded our pine forests on the southern border of the State. It confines itself to the yellow pine group, and apparently does not molest the white pine or the hemlock. Its chief centre has, therefore, been in Fulton county. I allude to a small brown beetle, which destroys the trees by boring tortuous passages around the trunk, immediately under the bark, and so destroys the cambium layer of young wood and bark. Apparently it reached us from West Virginia, where its ravages have been most disastrous.

Into the latter state, a species of the insect (genus *clerus*) has been introduced from Germany, and turned loose in the forest. A species of *clerus* was found very common in the infested trees of Fulton county. It remains to be determined whether it is the introduced or a native species. There is no doubt that it preys upon the tree-destroying beetle. Possibly it may limit the ravages of the latter. One most important fact is that the invasion of the beetles does not spread so rapidly as to discourage the hope that it may be checked by removing and burning insect infested trees. It is simply useless, or worse, to

cut them and allow them to lie on the ground. It simply encourages the dispersion of the insect."

Your Committee, feeling that the object for which they were appointed has largely been accomplished, and that they might with propriety ask that they be released from further duty, and the Committee on Forests and Forestry dropped from the list of your standing committees, but should it be the wish of your Board, your Committee feel that, if continued, they may be able, by counsel and correspondence, to aid the State Forestry Commissioners in their work.

In concluding their report, your Committee would congratulate you upon the fact that the interest taken by your Board has as much, at least, as any other factor, aroused the interest which has culminated in the appointment of a well equipped and well supported Forestry Commission, whose reports can be relied upon to supply the long felt want of reliable and practical forestry information.

REPORT OF THE COMMITTEE ON CEREALS.

BY D. H. PATTERSON, *Chairman, Webster Mills, Pa.*

Your Committee would respectfully submit the following report:

Wheat and rye are a full average crop throughout the State, and of fine quality—the largest and most nearly perfect crop harvested for years. The average yield of wheat will be quite 18 bushels per acre. The acreage in wheat is about the same as for several years past, but that in rye is decreasing, excepting in parts of the State in near proximity to the larger cities and mining and manufacturing centres.

Oats is reported at not over one-half a crop, the exceptionally dry weather during July preventing its yielding abundantly, but the grain is bright and heavy. The system coming into vogue in different parts of the State of sowing corn stalk ground in wheat has caused a marked decrease in the acreage of this cereal.

Corn is a short crop and will probably not average more than one-half. In some counties the yield will be much less, and in a few localities there is almost a total failure. Owing to the drought, corn was prevented from earing and maturing properly. The short crop of corn, together with the low price of wheat, has caused many persons to feed wheat to their stock.

Buckwheat is also a very short crop, owing to the hot, dry weather during the month of August. While in some counties a half crop is reported, in many localities where this grain is grown extensively and is the main dependence of the citizens for food, it is not more than one-fourth of a crop.

The prices of the various grains are, at this writing, October 28, 1893, in the Philadelphia market, as follows: Wheat, 68c.; rye, 55c.; corn, 49c.; oats, 36c.

The crisis in money matters, through which we are passing, causing a want of confidence in banking institutions and all kinds of com-

mercial paper, has had the effect of bringing farm lands into better demand than for some years past. Where a farm is offered for sale there is no trouble to find a purchaser.

REPORT OF COMMITTEE ON BIRDS AND MAMMALS.

BY DR. B. H. WARREN, *Chairman, West Chester, Pa.*

We have, during the past few years, heard many complaints from farmers residing in different sections of the State, concerning the destructive habits of the woodchuck.

In some parts of Western Pennsylvania our informants claim that this species is rapidly on the increase.

At the last session of our Legislature (1892-93) a very determined effort, under the leadership of Hon. Isaac H. Robb, of Mercer county, (a section of the State where woodchucks are reported to be especially numerous, and a very serious annoyance to the farmers), was made to pass a bounty act, which would allow a small premium for the killing of these animals.

The efforts of Representative Robb and certain of his colleagues, who faithfully labored to secure the same end, failed because several other influential members of the House were determined that if a "scalp act" was passed, premiums should be allowed for the destruction of a number of animals, both furred and feathered, which, in the main, were known to those who had carefully investigated their economic relations, to be far more beneficial than detrimental to the farmer's interests.

When it became evident that to pass a bounty act which would include with the woodchuck, several species of birds and quadrupeds which were serviceable on the farm and in the fruit orchard would also have to be included, it was deemed best to abandon the entire bill, as Pennsylvania, under the ill-advised scalp act of 1885, was obliged to pay considerably over \$100,000 for the killing of birds and certain other animals which preyed almost wholly on noxious kinds of insects and destructive rodents, as was clearly proven by the investigations made under the direction of the State Board of Agriculture, and which resulted in the repeal of that portion of the act which had to do with the killing of our feathered friends.

The woodchuck or ground hog (*Arctomys monax*—Linn), as it is best known throughout our farming districts, measures about 13 inches from the tip of the nose to the base of the tail. The bushy tail is from four to seven inches long. The ears are short and rounded, and thinly clothed with hair on both surfaces. The body is thick and heavy, and the legs are quite short, so that the belly nearly touches the ground. General color above is brownish-gray, with head, tail and feet dark brown, the belly reddish; fur of body soft, woolly, and mixed with long, coarse hairs. The woodchuck is found very generally throughout Pennsylvania, but in the mountains and thinly settled timbered

districts it is much less frequently met with than in the farming regions. In the latter part of summer, and in the autumn, woodchucks frequently retire from their burrows in the grass fields and are to be found inhabiting burrows in groves and about the borders of woods, especially in localities where the ground is rocky, where they remain during the winter months. Woodchucks, according to the writer's observation, seem to prefer to make their homes in rocky hillsides, either in or near grass fields, particularly clover, and cultivated lands, yet it is by no means unusual to find them burrowing in level, dry grass fields.

Occasionally the woodchuck takes up his abode in rocky ledges, and a reliable authority states that he sometimes has been found domiciled in the hollow roots of large trees. Usually, however, this animal lives in extensive burrows, which are made by himself in the ground. Where the nature of the country will admit of it, the woodchucks select a projecting rock, in some fissure under which they can dig their burrows. In other localities they dig them on the sides of hills, or in places where the surface of the ground is nearly level. These burrows or excavations are sometimes extended to the length of twenty or thirty feet from the opening; for the first three or four feet inclining obliquely downward, and the gallery being continued farther on, about on a level, or with a slight inclination upward to its termination, where there is a large chamber, to which the occupants retire for rest and security, in which the female gives birth to her young, and where the family spend the winter in torpidity."—Audubon.

The woodchuck, in this locality, is said to bring forth her young, generally three or five in number, in the month of May. In about three weeks after birth, Audubon says, the young are able to come out and may be observed playing about the mouth of the burrow, but ever on the alert for an enemy, and, on the slightest alarm from their watchful mother, they speedily retreat into the hole. When the young are a few months, some say about three months old, they leave the mother, dig their own burrows, and shift for themselves. A burrow is never occupied by more than one family.

In the autumn, prior to going into winter quarters, these animals are usually very fat, and at this season it is said their flesh, if properly cooked, is good eating.

The fur is of no value, but the hide, when well tanned, is very tough and durable.

In February last the writer made inquiry by letter and circular of a number of local naturalists and farmers in different sections of the State concerning the woodchuck. Extracts from some of the answers received are as follows:

"Woodchucks often do destructive work on the ripening crops of corn, oats and buckwheat."—J. Albaugh, West Hickory, Forest county.

"I have often been obliged to trap coons, muskrats, and woodchucks, to save corn, buckwheat, peas and cabbage. Cannot grow cabbage or celery on some parts of the farm because of woodchucks and rabbits."—Theodore Day, Dyberry, Wayne county.

"Is common and does damage by digging in clover fields."—August Koch, Williamsport, Lycoming county.

"Woodchucks are very plentiful and they are a great nuisance to the farmers; they eat our clover and corn, and their numerous burrows endanger the legs of horses and cattle."—Hugh Lackey, Clark's Mills, Mercer county.

"In clover fields they burrow and bank in such a manner as to make it very provoking to the harvest hands, and they also destroy large quantities of clover by eating and trampling it down. In the corn fields they get in their work of destruction, and they also destroy many pumpkins by peeling off the outside and leaving them to rot."—A. B. Murray, Henderson, Mercer county.

"They destroy wheat, corn and cabbage."—Charles E. Randall, Catwissa, Columbia county.

"Woodchucks burrow in high places, side hills or any locality where water will not bother them. In meadows and cornfields they are very destructive to the crops around a hole for five or six rods; they will devour corn, clover, oats, wheat, buckwheat, rye and barley. When mowing or ploughing it is dangerous to drive a team over the ground where they have burrowed; in such places horses become so afraid that it is almost impossible to get a team to step over a hole. I have often had to drive around their excavations and leave a large patch of grass, which afterwards had to be cut off with a scythe."—Frank Gallagher, Utica, Venango county.

"Woodchucks are plentiful and getting more numerous. They destroy almost all kinds of crops, and especially corn."—S. H. Haslet, Tionesta, Forest county.

"Woodchucks are quite common and increasing. They do damage in meadows, especially to clover, by trampling and also by digging holes, thus making it dangerous to the teams when mowing."—Luther Gates, Beaver Centre, Crawford county.

"Is numerous; destroys corn, melons, pumpkins, clover, etc."—E. M. Davis, Grampian Hills, Clearfield county.

"The woodchucks are our worst four-footed pests, being very destructive to corn, wheat, and clover. They dig great holes in the ground, which makes it very unsafe for horses in plowing, or when running loose in the fields. They destroy much more grain than they eat, and they frequently burrow into underground drains and stop the watercourse."—Alexander Donaldson, Mercer, Mercer county.

"The woodchuck does some damage to corn crops."—A. L. McKibben, Green Garden, Beaver county.

"Ground hogs are very numerous and destructive to different crops. In some of our pastures it is hardly safe to turn a horse out to graze. I recently had to kill a valuable horse that had a leg broken by stepping into a ground hog's burrow."—C. Perrine, Sandy Lake, Mercer county.

"Woodchucks do much damage to our corn, and they also destroy oats, wheat, buckwheat, cabbage, turnips, beets, beans, radishes; also vines of the pumpkin, squash, melon and cucumber. I have also known them to bark young fruit trees. In clover fields they are particularly troublesome. They will dig holes and pile up sand and gravel, sometimes two or three bushels in a place which will nearly ruin a mowing machine. When working, horses often break through into the burrows and injure themselves, the machine and harness. I have knowledge of four horses in this locality which had their legs

broken in woodchuck's burrows, and they had to be killed."—Arthur Martin, Sandy Lake, Mercer county.

The woodchuck, if hunted very much, soon becomes wary, and difficult of approach, but if a hunter is acquainted with the habits of the animal, he usually can get within good rifle range. Woodchucks can easily be caught in strong steel traps, if the latter are set with care and hidden from view. I have been informed by two or three farmers that they have soon gotten rid of all the ground hogs on their premises by putting strychnine on apples or other food which they would eat, and then placing the poisoned materials in and about their holes. This, of course, is a dangerous practice and one which should not be engaged in. A very effectual method of destroying these animals, and one which is, I am informed, adopted by a good many farmers in eastern Pennsylvania, is described as follows: Take a porter or small beer bottle, fill it with blasting powder; take a piece of fuse about 10 feet long, place one end of the fuse in the neck and into the powder, then stop the bottle up tightly. When this is done, push the bottle into the burrow which is occupied by the ground hog family. Then fill the burrow up for a distance of several feet from the entrance with stones and dirt, and fire the free end of the fuse, which, of course, should be allowed to protrude from the mouth of the burrow.

The concussion which is occasioned by a blast of this kind is said to be certain death to a ground hog, or any other animal which may have taken refuge in the subterranean retreat.

REPORT OF COMMITTEE ON FRUIT AND FRUIT CULTURE.

BY GEO. HOPWOOD, *Chairman, Uniontown, Pa.*

Your committee would respectfully submit the following brief report on the fruits of Pennsylvania. All fruits bloomed profusely, and in the early spring the prospect for an abundant crop of fruit of every variety was very promising.

Apples.—The apple crop is very limited, in fact it is almost a failure. Some favored localities enjoy a partial crop, but the recent high winds have damaged them seriously. Of all the varieties of fruit grown, the apple is prized as the most healthful, useful and valuable, and to be deprived of its health giving properties is a real hardship. The scarcity of apples may be traced to several causes: cold rains at time of blooming, the long continued drouth and the neglect of fruit growers and farmers to freely use the spraying apparatus. In every instance where a crop or even a partial crop is reported, the credit is given to persistent spraying.

Peaches may be reported as an average crop of marketable fruit. In several counties, however, the drouth damaged the fruit, also the trees. Much more interest is manifested than in former years in the cultivation of the peach.

Pears are much below the average, both in respect to quantity and

quality. The extreme drouth damaged both the fruit and the trees in many places. Here again is an illustration that spraying will pay. Gabriel Hiester, of Dauphin county, writes: "My pears are unusually smooth and perfect, which I attribute to my free use of the spraying outfit. I went over my orchard once with Paris green for the codling moth, once with the Bordeaux mixture and once with the ammoniacal solution, and I never had as large a proportion of perfect fruit."

Plums are a light crop, owing to the dry weather and the curculio. Eternal vigilance is the price of success in growing the plum as well as other fruits. Henry C. Snively, of Lebanon county, says: "Plums were a fine crop, the result of combating the 'little turk' by jarring the trees in the morning and destroying the insects. I lay a white cloth under the trees when jarring and quickly destroy the little marauder before it flies away. In this way hundreds are put away in a single morning."

Cherries were not a full crop and poor in quality. A few favored localities reported a good crop, mostly of the sweet varieties.

Quinces were a fair yield, but rather under size owing to the drouth. Fruit growers and farmers in general make a mistake by not growing more of this much prized fruit.

Grapes.—The crop was fine both as to quantity and quality. Less complaint of rot and mildew than usual. The largest, finest and most perfect fruit placed on the market was by those who spray and bag their grapes.

Strawberries were a good crop, but the drouth greatly shortened the season and damaged the crop. Young plantations were also damaged by the dry weather and we cannot expect a full crop next year.

Raspberries presented a beautiful appearance in the opening of the season, but were greatly damaged by the dry weather. We found that heavy mulching between the rows greatly aided the plants in resisting the drouth.

Blackberries were almost a failure from the effects of the dry weather. Gooseberries and currants were a fairly good crop in favored localities. The great loss from insect depredation that farmers and fruit growers meet with annually, and which is looked upon as being beyond their control, can be completely checked by the free use of the spraying apparatus.

E. B. Engle, of Franklin county, writes: "Our fruit growers do not fully realize the importance of spraying for the prevention of scab and codling moth. I believe the liberal use of insecticides and fungicides will introduce a new era for our apple growers."

Prices rule about as follows:

Apples, 75 cents to \$1.00 per bushel.

Peaches, 75 cents to \$1.25 per basket.

Pears, \$1.25 to \$2.00 per bushel.

Plums, \$1.50 to \$2.00 per bushel.

Cherries, 6 to 10 cents per quart.

Quince, \$1.50 to \$2.00 per bushel.

Grapes, 3½ to 5 cents per pound.

Strawberries, 10 to 12 cents per quart.

Raspberries, 8 to 10 cents per quart.

Blackberries, 8 to 10 cents per quart.

Currants, 10 to 12 cents per quart.

REPORT OF COMMITTEE ON ENSILAGE AND FODDER CROPS.

BY JASON SEXTON, *Chairman, Spring House, Pa.*

Our report on ensilage and fodder crops will contain nothing especially new. From all the information gathered and from general observation, the fodder crop the present year is far below the average.

A very general report from all quarters confirm us in the belief of the falling off of the average yield of corn, and as corn and corn fodder are the greatest and most to be relied upon of all the fodder crops of our State, the shortage in this line of feed and fodder and the consequent loss, is a very serious one to the farmers of Pennsylvania just at this period of our great financial depression.

While the loss in fodder will not be as great in proportion as the loss in corn, yet from all the information given us the great corn fodder crop will fall at least forty per cent. below the average. This tells but too plainly the story of excessive spring rains, and of our severe summer drouth. The injury to the crop, of both grain and fodder, by the great wind storm following the first rain after the drouth, was very great, breaking off much of the fodder and causing the corn to ripen badly, and greatly increasing the labor and expense of harvesting.

The fodder grown for ensilage suffered from the same causes, making the expense of labor and harvesting proportionately large, yet we doubt if any forage crop will give as general satisfaction and produce as good results for the labor and expense of preparing it, as the ensilage now stored in the different silos, by our best and most careful farmers, throughout the State. We think our farmers who are using the silo are gradually and surely learning how to grow cheaply, large crops of ensilage corn of much better quality and with much less labor than formerly.

With the improved machinery for planting and working it, no forage crop can be grown so cheaply and with an almost certainty of a large yield, as the corn for ensilage; and by the introduction and use of the new harvesting machines, now upon the market, the labor and expense of harvesting the crop, which heretofore has been a great obstacle in the way of the farmer to the general use of the silo, will be greatly reduced, thus obviating one of the most serious objections to the general use of the silo among the dairymen of our State.

We believe the silo has come to stay, and the progressive dairymen upon the high priced lands of the east, will soon come to consider them a necessity. In our own experience we have found no way so easy and satisfactory, when we have had the room, to dispose of our fodder after corn husking, as to cut it as it is being hauled from the fields and pack it solidly in one of our silo pits; it is then all ready for use and much improved in condition and quality, and much better than when left ricked or stacked out in all kinds of weather. The new corn husking machines, with their cutters and shredders attached, preparing the fodder for immediate use or ready to pack in the silo, or some good tight mow, will no doubt be a great improvement on the present method of ricking the fodder or leaving it standing in the

shocks in the fields, exposed to all kinds of weather, thereby causing it to rapidly deteriorate in quality, thus losing much of its feeding value.

The use of ensilage has no doubt received an impetus from the results of the recent experiment of Prof. Cook, of the Vermont Experiment Station, by which it was clearly demonstrated that in this form the dairyman can obtain more feeding from his corn crop than by any other plan.

In the experiment alluded to, a given amount of corn was divided into four equal parts; one was cut and run through an ensilage cutter and stored in the silo in the usual way; another was cut, and after all the ears had been picked off, was run through the cutter and stored as ensilage, the husks being afterwards stripped off and placed with the ensilage from the same plot; the ears were afterwards ground and fed with the ensilage in the usual way; a third plot was hauled to the barn, ears and all without husking, and carefully bound up in large shocks so as to secure it as much as possible from loss by exposure; a fourth part was cut, shocked, husked, the fodder cut up and fed with the ears after grinding.

The corn produced by the four plots was, by this plan, fed to the stock in four different forms, each of which gave food containing the nourishment contained in the same area of corn.

As a result it was found that the whole ensilage gave a result equivalent to 398 pounds of butter, that the second lot fed as ensilage with the ears ground and fed with the fodder, gave an equivalent to 317 pounds of butter; that the fourth lot, hauled from the field without husking, and cut up and fed ears and all, without being ground, gave an equivalent to 360 pounds of butter, while the fourth of the crop, which was cut, shocked, husked, ground, and the fodder cut and fed with the meal, gave an equivalent to 316 pounds of butter.

Prof. Cooke, in his report, states that the saving of the crop by ensilage cost no more than the average of the other three methods, and the result clearly proves that it gave very much the best results. Supposing that it cost no more than the other methods and that we compare it with their average, and we will note that it showed a saving of 67 pounds of butter, which, at but 30 cents per pound, amounts to \$20.10.

The hay crop, from all information at hand, is far below the average one, and will no doubt fall at least twenty-five per cent. below an average. The prices of hay are good, and no doubt will remain so during the coming winter and spring, and he who "farms for profit" will do well to economize in every possible way with all of his fodder crops and save for the market all the saleable hay possible.

THE REPORT OF THE COMMITTEE ON ROADS AND ROAD LAWS.

By S. R. DOWNING, *Chairman, Goshenville, Pa.*

The road movement in Pennsylvania, following the history of all reforms, is slow in growth—wisely, because necessarily slow.

Yet there has been material progress. Pennsylvania led New York and New Jersey in passing laws enabling counties or townships to loan money for permanent road structure; laws that were in no sense compulsory, merely imparting freedom to districts to do as they pleased with their own, without hurt or harm to other districts or people.

The loan of Pennsylvania differs from that of her sister states in that the Pennsylvania law is intrinsically a township law, while those of New York and New Jersey are county laws. Thus on the trite principle that large bodies move slowly, the advantage seems to be with Pennsylvania.

The action of the Pennsylvania law is placed strictly under the guidance of the court, subject to the provisions of the law. The law simply empowers supervisors to loan money in a sum equal to an entire indebtedness of seven per cent. on the township valuation whenever the citizens shall so decide by a majority vote, the court passing upon affidavits as to the legal conduct of the vote, counting the ballots and making decree.

This law was enacted at the inception of the agitation for better roads and was passed to meet at that time a local appeal.

Even under this law, as in the case of our border states, New York and New Jersey, little progress has been made in road structure throughout Pennsylvania.

So far as Pennsylvania is concerned, there is no reason why its loan law has not been generally utilized.

First, may be named the existing oppression from high taxation.

Second, the inequality of taxation, the claim being that all property, as well as users of roads, should bear an equal share in building and maintaining them.

Third, a general aversion against mortgaging the reality of townships.

Yet road reform, an improvement of the system and propositions of money to aid townships from the State, has had equal consideration with schools and tax reforms upon the part of our recent Legislatures. It seems to be the thought of a large portion of our citizens that, should tax reform take precedence of road and be the earlier accomplished, it would naturally follow that the ability to build roads would be greater, and thus our mileage of permanent roads would be increased. On the part of our citizens, it is contended that if the equalization of taxes is brought about by direct appropriation from the State revenues to county and township uses, road structure would be specifically and thus more largely assured, and also taxes would be equalized. Thus, the legislative issue has been joined between a searching, local taxation, touching corporate as well as individual property, withdrawing from the State certain sources of revenue, and, on the other hand, appropriations by the State to specific uses. This being the status of a leading issue throughout the State, it is plain to be seen that our people, generally, are disposed to await a settlement of the issue before largely commencing the structure of roads.

There is another fact that is pertinent, auspicious of tax relief, and an earnest indication of better roads. This is the decrease, to a minimum, of our State debt under the economical administrations of both our late Governor, General James A. Beaver, and our present Executive, Honorable Robert E. Pattison. In fact, it has been authoritatively de-

clared that our State is virtually out of debt, with a balance at hand equal to the loan not as yet due, and that the only bar to liquidation is refusal on the part of bond owners to sell at less than an exorbitant premium.

Again, we believe that the citizens of our State are approaching the conclusion that it would be economical to abolish the plan of working out taxes—a plan that has been dropped by the older countries, and seems to be peculiar to this country. Our people are beginning to figure on the old system, and that is a healthful sign. It may be said, however, that want of money, need of more cash for the products of the farm, a lighter taxation would facilitate the determination of the people as to the adoption of the cash tax.

Roads have been built, and a beginning made in Pennsylvania. This, chiefly in counties adjoining cities or townships adjoining boroughs. Roads also have been built leading to railway stations, and, in many cases, has been in the shape of private subscriptions. Several townships in the vicinity of Philadelphia have made loans and built roads at a cost to contractors of about \$7,000 per mile, while one township 20 miles out, built its own roads for \$5,000 per mile, saving last year \$1,750 in maintenance over the old cost, holding the mileage down to an excess of but half a mill over the old millage, and turning into the pockets of its citizens the proceeds of the loan for the service of crushing and hauling stone. More than this, these citizens calculate that, having 30 years in which to pay the loan, they will also have the advantage of a 30 years' saving from their permanent roads, stone and iron waterways. In other words, if the citizens save each year \$1,700, as they did last year, and, during 30 years, the roads will more than pay their cost. Thus, the citizens were permitted to earn \$30,000 clear in these hard times, and, more than this, the citizens of the county town contributed \$750 per mile for three miles.

True, other townships adjoining the one cited have built roads for cash with but little raise in taxation. These townships, however, are building but single miles and fragments of miles yearly. So that, at the present rate of building, it will require 10 to 15 years to reach the mileage of road built by the township making the loan. Credit the township making the loan with the saving of these miles in time, draft, maintenance, not saying anything as to comfort, school or church going, and we will have a true record of the difference between roads built under the slow cash usage, or the quick credit plan.

Yet, conditions differ. While these townships are building at a low cash rate, roads are costing other townships in the same county an excessively high cash tax; in the latter townships the valuation is lower, machinery is not used, and other conditions enter into the operations that increase the burden.

So, too, in the matter of township loans for roads, conditions may so differ that where, in one township, it may be safe and a good money operation to loan, in ten townships it might be dangerous and a loss to borrow money. Thus, unlearned and unadvised as to these varying conditions throughout the State, we are not free to commend the loan plan to every township citizenship throughout the State, feeling that while it is evidently wise for boroughs to borrow for streets, or lights, or schools, it may be as unwise to so borrow upon the part of other townships that may be under the same ban of prohibitory conditions. It can be said, without affront to any one, that

the building of the best roads at the lowest cost depends mainly upon the business insight, spirit and force of the citizens of a township.

There were numerous road measures placed on the calendar during the last session of our Legislature, from the bill simply creating township road commissioners up to the Kirk bill, proposing that the State issue and sell bonds to the amount of six millions of dollars, each year for ten years, making a total of sixty millions, at three per cent. interest, the townships being liable for interest and principal, the first installment of principal to be paid after 20 years. The bill proposed the taxing of railroad property, chartered corporations, oil operators, nail factories, glass works, stone quarries, iron ore banks or mines, coal and gas works, and all personal and real property. The proceeds of the loan to be distributed according to acreage. There being about 24,000,000 of acres in the State, the loan would yield about \$2.90 per acre, or say exclusive of salaries and expenses, \$2.75 per acre. This would yield, say Manor township, Lancaster county, with her 24,000 acres, the sum of \$66,000, or the equal of 12 or 15 miles of roads. The author of the bill claimed that the poll tax proposed by the bill would mainly pay for the interest.

This, together with each of the other bills, had its partisans, so that it was a long time before members could agree upon any one measure. The bill that finally passed the house by 103 against 72, and, after amendment, passed the Senate, was the Nesbit bill, No. 74; but, pending conference between committees of the two houses, the Legislature adjourned and the bill was lost.

This bill that seemed to have in it the possibility of adoption, proposed to create the office of county engineer or supervisor, to provide a poll tax of one dollar, and an appropriation out of State revenues of a million of dollars, with distribution based upon the number of miles of roads in each county; the engineer to be chosen by the electors of the county, with term of office covering three years, and with salary as fixed annually by the township supervisors. The bill set forth the duties of the engineer as follows: To designate certain roads as highways, and to be permanently constructed; to draw up specifications and enter into contracts; to require of township supervisors a record of work done and money disbursed; to return to the Auditor General the number of miles of rural roads in the county or city. The bill also provided for a triennial election of one supervisor by the voters of each township, empowering each supervisor to district his township and employ in each district a foreman; the supervisor to levy the tax as now, but not to exceed eight mills; a discount to be granted on payment of taxes within a certain period, and a per cent. added after a designated time; taxpayers were given preference in the employment of labor. Both county and township supervisors were required to give bonds, and the salary of township supervisors was fixed at \$2.00 per day.

In the fact that this bill, coming so close to enactment, limited the road tax within eight mills, lies the least semblance of confidence upon the part of our Representatives, and, even back of them, upon the part, largely, of their constituency, that the saving of money evolved from scientific and thus economic operation, will yield a margin, backed by the aid of a poll tax and a single million of dollars, sufficient to build permanent roads in any township under the limit of a reasonable millage. In parts of Chester county even, where valu-

ations are large, the millage has touched 13 mills, with but fragments of rough and narrow roads built.

Until the best roads are built under our close observation, we do not realize how much there is to learn as to road building, its perfection, durability, cost, and its economic structure.

The cry is heard throughout our State, "we do not want any more pikes." It seems as not yet realized that pikes, the hand-made road, the sprawling, indiscriminate deposit of loose, coarse rubble, called pikes, are sinking into the past, and that the smooth, compact road, scientifically built and that of material calculated to bind and lock and endure, is coming into being. The assertion may be ventured that a large number, even of the city people, do not realize that there can be any more than a cobble or granite street or an old time pike excepting it be asphaltum paving.

And thus, having much to learn as to road economics and legislation, it is well that the road movement even lags along in its stubborn leisure. Road sentiment and intelligence is certainly on the increase and seems to warrant that in 1895 the Legislature of Pennsylvania will enact a law more acceptable, easier of operation, more effective than that most favored by our legislators of the session of 1893.

ADDRESSES AND ESSAYS AT MEETINGS OF THE BOARD AND FARMERS' INSTITUTES.

PENNSYLVANIA AGRICULTURE.

BY HON. R. E. PATTISON, *Governor and President of the Board.*

(Extract from reply to the address of welcome at the Kittanning meeting.)

We are in the habit, and justly so, of calculating the enormous production of our State from the manufacturing standpoint. There is a population of little less than half a million engaged in this interest in the State of Pennsylvania, and the annual products of this State from the manufacturing interests represents one-seventh of the products of the United States, upon a money valuation, so that we are not surprised, therefore, that we are always putting forward the manufacturing interests—a very great industry of our Commonwealth. But, more than that, alongside of the agricultural interests of Pennsylvania, we have the enormous products of our land. Indeed, the Commonwealth of Pennsylvania is supplying the entire country with anthracite coal. The whole products of hard coal going out to this nation to-day go from the territory of Pennsylvania, and, in addition to the anthracite, there is an enormous product going from the bituminous regions. So again, there is an industry represented by untold wealth that, for the time being, seems to overshadow the agricultural interest. There is another industry, the natural product of oil, the enormous quantity shipped, not only to the different parts of the State, but to the world, represented by tens of millions of dollars, so

that those interested in these manufacturing interests, in these coal interests, oil interests, and other interests, seem to overlook this agricultural interest, which is one of the foremost interests in a State known as a manufacturing State.

Let us consider for a moment whether this proposition is at all exaggerated. There are to-day, in the Commonwealth of Pennsylvania, over two hundred thousand farms. There are engaged upon those farms more than three hundred thousand people. There is an annual product coming out of the farms of Pennsylvania represented by a money valuation of two hundred millions of dollars every year. There is an assessed value in the farm land of Pennsylvania of nearly two thousand millions of dollars. Why, by these figures men are at once appalled; they do not attempt to make any calculations, running in the hundreds and thousands of millions of dollars. So, when we come to compare the agricultural industries with the other industries, we find that they stand away beyond other industries. One of the reasons why the agricultural interest has not been represented as other interests, is because of the lack of means of communication which formerly prevailed, had much to do in preventing its representatives from assembling and discussing the questions bearing upon their calling; whilst, on the other hand, the merchant, the manufacturer, the oil producer, the coal operator, and the coal miner, because of being closer in following their pursuits, could assemble and hold their conventions. They have their magazines, and their periodicals, and their local papers. They meet and cross each other in their pursuits, day in and day out. With them, their work is going on constantly; mind rubbing against mind in these pursuits, and, like iron against iron, sharpening men interested in these special industries in which they are daily interested. Their conventions are assembled, and the interests concerning these important pursuits are discussed, not quarterly or annually, as we here in a representative body meet, but by popular meeting. So that in the past these other industries have had the advantage over the agricultural interests. But it seems to me that that is not to continue. Here we meet, in the western part of the State; there are representatives here from Chester county, three hundred miles away; there are others here from Susquehanna county; there are others here from the northwestern tier and southwestern tier of the counties of this Commonwealth. These men have all come together in this meeting by means of ready communication inside of 24 hours. They are here assembled to discuss the agricultural interests. So that, by reason of the more easy methods of communication, the importance of the agricultural interests will be advanced, along with the other interests that I have referred to. Not only has there been an advancement in the case of communication, but also in the publication of agricultural periodicals and papers which are issued from time to time. Why, the agricultural periodicals to-day, in all the different branches, are as intelligently presented as any other industry in our country. So that the means of communication, and the literature, which was not so frequently scattered among our people, is brought to-day to the door of the agriculturist. Therefore, I say that the agricultural interests, as represented by this Board, commands, or ought to command, the consideration of the whole community.

Now, with reference to these industries, I would say, they are solely dependent upon the agricultural interests; absolutely dependent.

What would any large aggregation of people, the city of Pittsburgh, for instance, do without the morning supply sent in from the farms of Pennsylvania and of the country? What would any community, engaged in any of the industries which I have named, do without the pursuit and the industry put in the agricultural interests of our Commonwealth? Stop the agriculturist, stop the hand of the farmer; stay the sowing and reaping, and it is the end of all others. Indeed, the great President, General Washington, beginning at the start of the government, concluded that the most important enterprise to be promoted was the enterprise which would lead on to the agricultural interest. The agricultural societies, local and general, date with the beginning of the government. So that those who were largely engaged in the formative period of our government believed that its success and hope for the future depended upon the success of this industry; and so, after all, the agricultural interest, which was peculiarly an agricultural industry, laid the foundation for all these other industries in our growth and development. Take the troublesome times which we are passing through, but more in particular, the times of 1890, beginning with November, 1890; there seemed threatening, at that time, a panic equal to the one which we are now passing through. Indeed, there was almost a suspension in Philadelphia and New York on account of the financial condition of the country. The banks were depending on their clearing house certificates. During the latter part of 1890 and the spring of 1891, the clearing houses had issued more than eleven million clearing house certificates. That meant that there was not sufficient trading so as to put money in the market and place the banks in a settled condition. The result was, that in order to uphold the credit of bankers and merchants, the clearing houses were compelled to issue clearing house certificates. During that fall there were many problems advanced as to the solution of the financial question. Essays were written, speeches delivered, lectures on political economy delivered, and many suggestions were made and remedies advanced. Among them the question of taxation, revenue, money, were discussed; all these questions were discussed as a method by which the problems were to be solved, but there seemed to come no relief. Men looked at each other, not knowing what a day might bring forth in financial centres, and there seemed to be no hope. Everybody read everything on this subject. Providentially, in my judgment, the year 1890 witnessed a crop in this country, from the fertile lands of our hillsides and valleys, such as has never been witnessed in its history. The wheat and corn crops were unprecedented. At that very time all of Europe and all of England in their crops of bread cereals had entirely failed. There was a failure of the wheat crop and there was no corn crop in the European countries and, of course, it was dependent upon this country, out of the abundance of the harvests of 1890, to furnish this product to European countries. At that time our wheat alone amounted to something like three hundred millions of bushels, which was to make up the deficit of the wheat crop in that country. What was the result? We were not only able to furnish all the wheat for the consumption of our people, and furnish all the seed wheat, but we were also able, if necessary, to send over two hundred million bushels to feed Europe. The result of that crop, taking it at one dollar a bushel, meant coming back to this country two hundred million dollars in gold at that time. So,

as soon as the harvest came in and the crops were stored, and as soon as the railroads began to move these crops, as soon as the men began to exchange their commodities, and the products from the farm lands were put in motion, the market began to rise, confidence was restored, and it led, in the spring of 1891, to an entire restoration, almost, of all business. So, I say to you, and I do not for one moment wish to belittle any of the other questions that are discussed, that the great resources of this land of ours, represented in Pennsylvania by this Board, now in your presence, more than anything else, has solved the financial problem which has threatened our country. Men may write theories and essays on this question, but there must be a hand-to-hand trading; and there must be trading to produce exchange. No financial theory will solve this problem except the direct exchange which has been in existence from the beginning.

Let me make another suggestion in relation to the agricultural interests, with reference to the resources of our country. In 1868, when the war closed, there was represented a bonded indebtedness of two thousand seven hundred million dollars, issued by the United States government—twenty-seven hundred million dollars. The average debt of the country, from the beginning of the government down to 1860, did not average seventy-five millions of dollars. Within six years, with a divided country, with the manufacturing interests standing still, with more than five hundred thousand able-bodied men withdrawn from the active pursuits of life, this country had issued two thousand seven hundred millions of bonds, and had sufficient credit to place every bond; and, notwithstanding the dark shadows which hung over our land, its credit was restored, enterprise sprung up, and business revived on every hand. Men went from the sword to the ploughshare. The result was that the people went to the West and, by their industry and thrift, they developed the resources of the great West, and out of the West came the products, which, together with the other resources of the country, helped to store up the wealth of the country so that to-day, out of two thousand, seven hundred millions of bonds, but five hundred millions of bonds stand of the original bonds of 1861. So, I say to you, that although we had, nearly 30 years ago, a country divided, a country oppressed, a country that did not know how the financial aid was to come, yet it has gone on to prosperity. Its borders have been enlarged, new states have been added, and, in addition to all the expenses which have been entailed from year to year, there has been paid off two thousand million dollars of indebtedness. Now, what is the use of the people of our land being alarmed about the question of five hundred millions of silver certificates, or any other kind of certificates? A nation, under the condition of this country in 1866, that can, with all its troubles, hold the credit of the world for two thousand millions of dollars, with a population in the neighborhood of seventy millions of people, with the enormous development made west of the Missouri, there can be no doubt that, out of the wonderful resources of this country, it will rise up to a greater and higher magnitude than ever before, and with a higher power of resources than ever before. Therefore, I say to the citizens of Kittanning, that all this industry and all this latent power here represented by the State Board of Agriculture, has been the means of solving the great financial problems of the day. You would not believe it if you were to look at these men who represent this great industry

in our State. They are a modest looking set of men. They rule with an iron hand. They insist on their programme and their institutes are carried through like clock work. I know them better than you, for I have boarded with them, ate with them, slept with them; so that I know them and begin to understand them. I want you to hear their discussions, and I believe after you have mingled with them and enjoyed their hospitality, you will feel that their coming here has not been in vain.

THE CARE OF FARM HORSES.

BY HON. N. B. CRITCHFIELD, *Member from Somerset, Jenners' X Roads, Pa.*

During the fall of 1872, when a severe epidemic of influenza among horses, which took the general name of epizootic, passed over the country, and men engaged in all branches of business in which the use of horses was necessary, had to suspend, a large iron firm in Pittsburg that was obliged to keep up its daily shipments to meet its contracts, purchased two pairs of heavy oxen from an Allegheny county farmer, who was feeding them for the butcher's market, but wisely concluded that in this emergency he would do better to yoke them up and drive them into the city to be sold for draft purposes.

After the farmer had exhibited the working qualities of the oxen to the entire satisfaction of the member of the firm making the purchase, and the bargain been closed, the price paid, the oxen turned over to the teamster, and the farmer was fully a square in the direction of the depot where he expected to take the train for home, the purchaser was seen running after him, calling upon him to stop. The farmer was not a little surprised to find himself pursued, and naturally enough feared that his customer had become dissatisfied with his purchase and wanted back the whole or a part of his money; but imagine his satisfaction when, instead of making any such demand, the buyer, almost out of breath from running, said: "I forgot to ask you what those things I bought will eat." However amusing to the farmer such ignorance on the part of his customer must have been, is it not true that many persons, some of whom call themselves farmers, have but little more knowledge of the wants of the animals they have in their service than was displayed by the iron manufacturer?

It is in the interest of these faithful creatures, so constant in their service and so ready to administer to our wants and make our burdens light, that this paper is written.

Three thousand years ago the wise king of Israel said, "A righteous man regardeth the life of his beast, but the tender mercies of the wicked are cruel." The man who does not try to acquaint himself with the constitution and wants of the dumb animals that serve him, so as to be able to provide for their comfort and health, can lay no claim to being called a good man; for, by his neglect, he is depriving God's creatures of that which in the economy of Providence is designed for them. The divine arrangement which gives to man "do-

minion over all the earth and every creeping thing that creepeth upon the earth," places upon us the burden of caring for them, even as we hope to receive the care of Him who has created them for our service and placed them under our control. Among the charges given me by my father six years ago, as I stood by his bed to receive the last instruction that a father may give to a son, there were none that I regarded as more sacred than that given in the words: "Don't let Jenny be sold, but take her to your home and take care of her while she lives." Jenny was his faithful horse that had then served him more than twenty years, although at that time she had the appearance and activity of a four-year-old colt.

The fact that our mute servants are denied the power of communicating with us in language that we can understand, their feelings and wants, and that they are therefore compelled to bear uncomplainingly whatever burdens are placed upon them, should prompt us to use every precaution to prevent their abuse, and to place them in condition to perform the service required of them with as much comfort to themselves as is possible.

The care of the farm horse properly begins with the colt. Most farmers, especially in the western part of the State, raise their own horses, and a knowledge of the manner in which colts should be cared for is as important to them as it is to know how to care for a team that is daily at work. Many colts are injured by being taken from the mother too young. In cases where it is desired to raise from the same dam a colt each year, early weaning becomes necessary. Unless the mother possesses a remarkably good constitution and receives special care, she will not be able to supply nourishment for a colt that is permitted to run with her until within five or six months of the next foaling period, and at the same time nourish a healthy and well developed foetus. When the constitution of the mother is exceptionally good, and the work she has to perform is light, by being well cared for she may produce a good colt each year, in which case, the time for weaning should be at about the age of four months. By this time the colt will have learned to eat grain, hay and grass, and will be able to do fairly well without its mother's milk. But to insure success in raising good, hardy and well developed horses, it is better not to attempt to raise a colt from the same dam oftener than once in each alternate year. By this means the colt can be allowed to run with its mother until it is six months old, when it will be better able to digest the rougher food upon which it must then subsist, which will give it an advantage that can easily be discovered in its appearance until it is fully grown.

When the colt is weaned it should be kept in a clean, well ventilated stable in sight, if possible, of the other horses. If it has been treated properly it will already be accustomed to the halter, and it should be taken out daily for exercise, a service which the average farm boy will be quite ready to perform. It should be fed four times each day, one pint of oats, crushed, or boiled, which is better, mixed with one pint of wheat bran, with all the clean, bright timothy or clover hay that it will eat. The grain ration may be increased with the growth of the colt, until it reaches about double the amount prescribed. The change that the system of the colt undergoes immediately after being deprived of its mother's milk, makes it necessary that it be supplied with plenty of clean, pure water. Watering twice

each day as is usually customary with other stock, may do, but three or four times a day is better. When the colt is one year old it may be permitted to run with other young horses in pasture. The second winter it will require no more grain than the first, although it will be considerably larger; the same grain ration with plenty of bright, well cured hay, will keep it growing and in good condition. While growing colts should be fed liberally, so that they may never feel the pinchings of poverty, and their growth may not be stunted, excessive feeding should be avoided. When the growth is too rapid the bone and muscles of the animal will be more tender, and the entire constitution will be less vigorous than when a steady, but less rapid, growth is secured. The grain already prescribed for the colt during the first winter, will be sufficient for each succeeding winter until the time comes when it is being prepared for work. Although its constantly increasing size will call for larger food supplies, as it grows older it acquires increased ability to assimilate the rougher qualities of food, and hence an increase of the grain ration is not needed. Daily exercise should not be neglected at any time during the period of growth. If the weather during winter be pleasant, colts may be turned loose for a short time each day in some convenient lot, and when it is rough and cold, a trot of a half a mile by the side of another horse when led out to water will richly repay all the time and trouble it costs.

With a protest against the reprehensible practice of feeding colts on corn, and the admonition to keep their quarters clean and well supplied with clean bedding, as well as to free their coats from dust and dirt at least once each day by the use of a stiff bristle brush, I leave them in the hands of the boys, who are their best friends, while I turn my attention to the care of the work horses.

The first thing essential in the care of the farm horses, is a well constructed and comfortably arranged stable. In this State where the bank-basement barn is so common, it would be well if farmers could be persuaded to provide stabling for their horses by erecting separate buildings. The basement of the barn affords excellent stabling facilities for cattle, but horses need more air and light, and are liable to contract diseases that are in some degree the result of defective ventilation. Where a portion of the basement of the barn is used for stabling horses, it is customary to take the end at which the greatest amount of light can be secured. This places the horse stable next to the outer wall, which is usually built of stone, and in very cold weather is likely to be full of frost. The injury that must often result from placing horses that come in from work in a state of perspiration near to such a wall and permitting them to remain in such a place while cooling off, needs only to be mentioned to show the impropriety of such an arrangement. But whether the stable be in the basement of the barn or in a separate building, it should be roomy and well ventilated. The floor should be made of firm, broken stone and clay, pounded together so compactly, and kept in such complete repair, as to prevent the absorption of the liquids contained in the manure. A clay floor, however solid and dry it may be, possesses the quality of imparting to the hoofs of the horse a moisture, the value of which cannot be over-estimated, especially to horses that are never permitted to run in pasture.

Next to be preferred after the clay floor, is a tightly-jointed plank

floor. Whatever material is used, the floor should be so tight as to prevent small particles of manure from passing through the cracks and forming a body of filthy matter from which unhealthy effluvia are constantly arising, and which is a fruitful source of disease. The floor should be level and not the highest at the front end of the stable, as is so often found to be the case. It is better, as a matter of economy, to suffer whatever disadvantages arises from the presence of liquid matter upon the floor of the stall, or provide for its absorption by furnishing an extra amount of bedding, than to have the horse crippled by standing in an unnatural position, to say nothing of the cruelty inflicted upon the animal. The width of the stable from rack to wall should not be less than fifteen feet, and the stalls at least six feet in width. The partitions between stalls may be made to suit the taste of the builder, observing, however, the caution to bring the partition plank so close to the floor as to make it impossible for a horse, while lying down, to get his feet under them, and also to have the upper half of the front part of the partition latticed with either wood or iron, so that ill-disposed horse may not be able to injure each other; those that are kindly disposed may enjoy the advantage of social communication.

Instead of a manger to receive the hay, which is in recent years, in my judgment, becoming entirely too common, the old-fashioned rack for hay and trough for grain, should be provided. Where mangers are used they are likely to be neglected and allowed to become filthy at the bottom, and the horse that is fed in this way will acquire the habit of keeping his head down in the manger while he is eating, by which means he is liable to inhale small particles of dust, which in the course of time injures his lungs and produces the disease known as heaves. The objection that the use of the rack fills the mane and hair of the horse's head with hayseed, can be overcome to some extent, at least, by so arranging the rack that the open frame from which the hay is taken, stands nearly perpendicular, or at right angles with the floor.

I have already referred to the necessity of proper ventilation. To secure this two things are necessary: First, to have some arrangement for supplying the stable with fresh air; and second, to provide means for carrying off the impure or vitiated air. The matter of ventilation in the summer, when the doors and windows may be kept open, is attended with little trouble; but in winter it is not so easy. If the doors and windows are depended upon for ventilation in very cold weather, there is danger that the horses may become chilled, and if no other disadvantage arises, it will require considerably more grain feeding to keep them in proper condition than would be required under more favorable circumstances. A good plan for admitting air, though somewhat expensive, is to place a plank box under ground sufficiently deep to be beyond the influence of the effects of heat or cold upon the surface, which, in this climate, is not more than four or five feet, and running it a distance of four or five hundred to a perpendicular outlet.

The boxed outlet should extend several feet above the ground, and at the top should be provided with a tunnel-shaped mouth, made of heavy tin or sheet-iron, which opens horizontally, and is so connected with the box that by means of a fan-shaped attachment opposite the opening, it will be so adjusted by the wind as always to receive the

breeze, whatever may be the direction from which it comes. The opening into the stable should be several feet from the floor, and as near the middle as possible without being brought too close to any part that is occupied by a horse. The box should not be less than six inches square on the inside, and if the stable is so located as to make it necessary to run the box through ground that is wet, it must be made water-tight, or instead of the wooden box, six or eight-inch tile, well cemented should be used. The air that is introduced into the stable by this means will be nearly the same temperature summer and winter, and in cold weather the doors and all other openings in the walls can be closed, while in warm weather, when it is desirable to close the doors to relieve the horse from the torment of flies, it can be done without in the least degree endangering their health or interfering with their comfort. The matter of relieving the stable of foul air is attended with much less difficulty. This can be done by running a sufficient number of board pipes, made in the form of flues, from the interior of the stable to the top of the roof. If the stable is small two such pipes, of which one should be open near the floor and the other near the ceiling, is sufficient. Larger stables may be supplied with a central or main pipe, which extends from floor to top of roof, into which a sufficient number of smaller pipes enter.

Every farmer should have an apartment connected with his horse stable, especially prepared for animals that are sick. This apartment should be so located as to be as free as possible from cold draughts occasioned by the opening and closing of doors. It should be well ventilated and provided with stove or other means of artificial heat.

I wish to close what I have to say concerning the stable and its appointments, by calling attention to the fact, that where the space immediately over the stable is used for storing hay, the ceiling should be perfectly tight. The feeding quality of hay, into which and through which, the effluvia and odors arising from the stables are constantly passing, is greatly impaired. The stable must be kept clean. Plenty of clean, dry bedding must be placed under each horse every evening. This is imperative and must not be neglected. Farm horses should be fed regularly whether at work or not. The practice of heavy feeding when horses are at work, and almost no feeding at all when they are idle, is a very bad though not uncommon one. Irregular feeding, or feeding more at one time than another, is liable to induce indigestion and a general unthrifty condition of the animal. The hay that is given to horses should be carefully cured and as free as possible from dust. The opinion held by many farmers and others, that horses should never be given clover hay, is radically wrong. If properly made so as to be free from dust or the effects of mow-burn, it is, so far as my knowledge goes, without exception the best hay that can be fed.

The grain feed in summer should be oats, and in the winter, it may be equal parts of oats and corn. At all seasons of the year, it is well, at least once each day, if not at every meal, to feed with the grain about half its bulk of wheat bran. Care should be taken to feed only grain that is sound and properly cleaned. Musty and mouldy grain is unfit food for any animal, and especially for one so worthy of the best as the horse. No rule can be given by which to regulate the daily allowance of grain that the horse should receive. A Methodist

preacher who travelled on horseback over portions of southwestern Pennsylvania when I was a boy, who weighed about 250 pounds and was therefore obliged to keep a large, able bodied horse, was accustomed to say when asked how much his horse should be fed, "Well, my lad, just feed him according to his work and size." This perhaps is as good a rule as can be given.

Feed three times a day as nearly as possible at the same hour, and just enough to keep the horse in a good, thrifty condition. For the average farm horse that gets all the good hay he will eat, this will be about four quarts of oats or its equivalent at each meal. The rule which some claim to observe, of feeding all the grain the horse will eat, cannot be depended upon, for while most horses that are regularly and properly fed will not eat more than they need, there are gluttons among horses as well as among men, that will eat more than they have the ability to digest and assimilate; and all that is eaten and not digested is not only wasted, but is a positive injury. A horse that has a habit of eating too greedily, so as to swallow his grain before it is properly masticated, should have a number of stones about the size of a hen's egg placed in his trough, so as to compel him to take up his grain a little at a time.

The horse, like all herbivorous animals, needs salt; and if a box be provided at one end of his manger or trough, in which a small quantity of salt is constantly kept, he will just take what nature requires to aid digestion and keep him in a healthy condition.

Turning horses that work during the day into pasture during the night, is a practice which, although common among farmers, is not to be commended. There is no food that is more palatable to the horse, or that is better adapted to his wants than certain varieties of grass; but the horse that is in the team daily should not be expected to devote a portion of the night, when he should be taking his rest, to gathering it for himself. A grass lot should be provided near the stable, so that the grass can be cut and given to the horse without any extra labor being required on his part. It will, however, be found beneficial to the horse to be permitted to run in pasture from four to six weeks each summer. The time to select for this is when there is sufficient moisture in the ground to soften the feet, and warmth enough to prevent him from becoming chilled when he lies down, and when he is least likely to suffer annoyance from flies, which will generally be during the latter part of the month of May and the early part of June. Even then he should be brought into the stable for a feed of grain at least once a day, and should be kept in during the part of the day that the flies are most troublesome.

An essential element in the care of horses is proper grooming. This should be done twice each day. When horses are at work during the day, less time will be required for this service in the morning than in the evening. A thorough brushing of the coat of each animal, from head to foot, with a stiff bristle or broom corn brush is all that is necessary before harnessing for the day's work. More attention will be necessary in the evening, hence it is important that the farmer should have his team ready and get to work early in the morning in order that he may have time for giving extra attention to his horses when the day's work is done. When the team is brought into the stable and unharnessed, the first to be done is to lay the hair of each

horse straight by the use of a currycomb or dull card. If, as is often the case, in winter and early spring, the legs are muddy and wet to the skin, each horse should be taken from his stall, and his legs washed clean with water that is blood warm, and then rubbed, first with soft straw, and then with stable towels or cloths, until they are dry. This being done, return him to his stall and let him eat hay until any portions of the body that are wet with perspiration have become dry, when he should again be removed from his stall and thoroughly cleaned with brush and comb, after which return him to his stall and give him his grain feed, and place his bedding for the night. In grooming horses, observe first, that a horse should never be cleaned in his stall, and second, that the currycomb used should not be too sharp or applied with such force as to scratch or injure the cuticle, or give the horse pain; nor should it be used on the legs or joints of the animal. Its use is simply to clean the brush, and to loosen dirt that fastens itself on the surface, and that settles near the roots of the hair, which, when loose can be removed with the brush.

Without noticing the care that is necessary in training horses for service, my treatment of the subject assigned me would be quite incomplete. I do not use the word breaking, for, although it is commonly used in this connection, when applied to the horse, I have no use for it in my vocabulary.

The training of the horse should begin when he is very young. The children upon the farm are naturally disposed to make the colt their pet, and, usually before he is a month old, he is quite gentle and will follow the boys about the barnyard to be fondled and caressed. This gentleness of disposition should be encouraged. Let the colt know that you are his friend and that all your purposes with regard to him are formed in kindness. While he is still running with his mother he should be used to the halter, and if the mother is at any time driven from the farm he should be tied by her side, instead of being permitted to run loose. In this way he becomes accustomed to moving with the team by the word, and by the time he is old enough to wean, half the training will be done, for what a colt once learns he never forgets. After weaning, when you will have less occasion to be brought in daily contact with him, do not cut his acquaintance. Make it a point to see him as often as possible, and keep up the friendly relation already established. When he is about two years old he may be harnessed for "light work." Remember, I emphasize the word "light," for the colt should not be put to heavy or exhausting labor until he is full five years old. When the harness is first placed upon the colt, it should be done with great care, so that he shall not become frightened. Before hitching him to any kind of vehicle, he should be placed by the side of a gentle and well trained horse, and driven until he becomes acquainted with the reins, and by their use can be readily turned in any direction, and until he can be started and stopped at will by the word. This being done, he is ready to be hitched to a light wagon, or any vehicle having a tongue or pole, so that, as I once heard an old farmer express it, "he can be fastened at both ends." The horse by his side should be so hitched, that in case the colt should not pull, he can draw the vehicle without any trouble, and the colt will very soon learn to do his part.

While training a colt, never allow yourself to be overcome by anger, or induced to whip him for failing to do a thing when he does not

understand what is to be done. Occasionally a case of stubbornness will be found, when the use of the whip is necessary. In such case, do not strike more than one sharp stroke at a time, but always wait to see what the effect of the first stroke will be before striking another. Violent whipping is a fruitful source of harm in the treatment of either colts or older horses, and should always be avoided. Be careful never to overload a young horse. More horses are spoiled and made balky in this way than in any other. If, upon coming to a steep pinch with a young team, you find you have more than your team can pull, do not make more than one fair trial, until, if necessary, you take off part of the load. It is better to make a second trip than to spoil your team and, possibly, still have the extra trip to make in the end. A team that has never balked by being overloaded, until it is thoroughly trained and fully developed, will never let you stick in the mud.

When a team is harnessed for work, the harness should be so adjusted as to make them fit properly and thereby enable the horse to perform his work with the greatest possible ease and comfort to himself. The collar, when pressed back against the shoulders, should fit up closely to the neck, and leave only sufficient space at the lower end to enable you to pass your fingers between the collar and the breast. The hames should be brought close enough together at the top to cause the collar to press lightly upon the sides of the upper part of the neck, but not close enough to pinch when they are drawn into place and fastened below. The hames hook, to which the traces are fastened, should be so arranged as to cause the greatest pressure to come upon the shoulder at a point about one-third the distance from the joint at the lower end of the scapula or shoulder bone to the top of the neck, immediately behind the collar. The collar should always be well cleaned as soon as it is taken from the horse, as dirt accumulating upon the face of the collar is an active cause of sore shoulders.

When the time for regular spring work comes, if the horses have had but little work to perform during the winter, their shoulders will be tender, and extra care will be necessary to keep them from becoming sore. A good precaution to take, is to prepare a strong decoction of oak bark, boiled in water, and for some days before the heavy spring work begins, bathe the horses' shoulders with it once or twice each day, and after beginning work, wash the shoulders with the decoction every evening as soon as the collar is removed.

But my paper is growing too long, and, while there are still many things that ought to be said in connection with the subject I am considering, I have but time, in conclusion, to make a few general observations, which, although I shall number them, I do not pretend to give in any systematic order:

First. Never drive a horse until perspiration has started and then let him stand still long enough to cool off suddenly without being covered with a blanket. If this be your practice and your horse is fortunate enough to escape at some time becoming chilled and contracting lung fever, he will be afflicted with chronic rheumatism before he is eight years old, and your knowing neighbor will be likely to tell you that he is "stove in the shoulders," an expression by which, I suppose, he means that he has become stiffened or injured in the shoulders by rapid driving, especially down hill—a thing generally believed in, but which very rarely occurs.

Second. Give your horses water frequently when on the road. There is no danger of injuring a horse by giving him all the water he wants when he is warm, if you are on the road and keep him moving for some time after drinking. It also pays well during the long summer days, when the weather is hot and you are working in the field, to unhitch your team and take it to the water at least once during each half day.

Third. Teach your horses when on the road to walk off at a brisk pace, when your load is light, but when heavily loaded, or at work on the farm, have them acquire the habit of a slow and steady gait. The gait of the horse, when at work, is a matter of habit, and by close attention you can get your team to acquire any gait you may desire for different kinds of work.

Fourth. Remember, that nine cases out of every ten of lameness in horses, if not a much larger proportion, is in the feet, and not in the shoulders, hips, and legs, as is too often supposed. When a horse shows signs of lameness, examine the foot carefully. A nail may be pressed into the frog or the sole of the foot, or a small stone may have worked its way in between the sole of the foot and the shoe. There may be a beginning of thrush, or the heel may be bruised, any of which causes of lameness you may not be able to discover without careful examination. If your investigations in these directions fail, remove the shoe and continue the search, and, in nearly every case, you will be able to discover and remove the cause of the trouble before any serious injury has been done. Acquaint yourself thoroughly with the anatomy of the horse's foot, and see that your smith does your shoeing properly. Never permit a shoe to remain upon a horse's foot more than six or eight weeks without being removed or reset. On young horses that are growing, the shoes should be re-set every four weeks.

But I must close, and in doing so, let me make as strong a plea as possible in favor of the very best treatment consistent with his usefulness, being given to this faithful animal. Acquaint yourself with his wants, that you may, in every way possible, minister to his comfort. Treat him with uniform kindness, and you will have his confidence and friendship. Keep no one in your employ who will inflict needless pain upon him, or neglect to give him proper care. The only man I ever discharged before the time for which he was employed was completed, was discharged for striking a favorite horse in anger.

The gallant Phil Sheridan owed much of the glory that crowned him, as a brilliant and successful commander, to the famous black horse that carried him on the memorable 19th of October, 1864, from Winchester to Cedar Creek. More of our success in life than we are likely to imagine depends upon these mute and willing friends, and he who neglects to provide for their wants, or willfully ill-treats or abuses them, is unworthy of a place among honorable men.

MANUFACTURE AND APPLICATION OF DOMESTIC FERTILIZERS.

By CALVIN COOPER, *Member from Lancaster, Bird-in-Hand, Pa.*

Domestic fertilizers are those that are made or produced on the farm, and may be of vegetable or animal matter; the latter, however, are generally considered of greater importance, and, as a means of stimulating vegetable growth, consequently produce the larger crop.

The vegetable matter upon the average farm does not, however, receive the care and attention, especially where clay soils predominate, that it should. Much of the success in cultivating clay soils depends upon its friable condition throughout the summer season, and the means adopted to keep it porous or sufficiently loose, to produce the best results. I know of no better, nor none so easily available to the farmer, as the growth of any rough vegetable matter that the land will produce, to preserve that mechanical condition so desirable to attain a crop.

I shall, therefore, in this paper, more particularly dwell upon the application of fertilizers to clay soils, they being the most common in our immediate vicinity. We have, in Lancaster county, upon the hilly and more rolling districts, thousands of acres of good, productive farm land, which is composed of a loose, fine shale, upon which some of the best crops are grown by the application of commercial fertilizers, almost exclusively; where the mechanical effect of vegetable matter is not so necessary as upon the clay soils of all, or nearly all limestone districts.

In utilizing vegetable matter upon the farm, the average farmers do not pursue methods that, to me, seem the most economical. There is always more or less growth of rough vegetable matter, consisting of coarse grass, weeds, etc., that, too often, are allowed to run to seed, thus exhausting from the soil part of the most valuable fertilizing matter that should, and could, very easily be retained if the farmer pursued a reasonable degree of care and observation in the welfare of his farm. It is a well known fact that most, if not all, plants absorb the most valuable elements in the soil at about the time of the formation and ripening of the seed. Hence, the farmer who allows this rough material to seed, not only suffers from the loss of expensive fertilizing matter, but permits the re-seeding of his farm to undesirable weeds, which will be a hindrance to his next season's crop. Now, the remedy is simple and effective. The most progressive farmers of my section watch closely the time when these objectionable plants come into bloom in their stubble fields, when a team attached to an old mowing machine is the implement used to utilize this vegetable matter for its mechanical effect upon the soil. The machine is set high enough to do no injury to the young grass. If the growth is excessive, the cutting of a portion of the grass is found to be an advantage. When the season is favorable, a second cutting will be no injury to the crop the following season. Farmers who are pursuing this method in my section have been the most successful in producing fine hay crops, and, in addition, are supplying their farms with an

abundance of humus, for the nourishment and protection of succeeding crops.

In the collection and application of our domestic animal fertilizers, some economical method must be adopted, by which the liquid, as well as the solid elements can be held and absorbed without too great a loss of their valuable ingredients. Some of our most learned chemists tell us the common practice of allowing manure to lie six months in an open yard, where air and rain are constantly decomposing the vegetable fibre, liberating gases and fertilizing elements that should be retained—they tell us the loss is from “60, 70, and as high as 80 per cent. of its commercial value.” Should we not, therefore, heed this admonition and adopt other methods by which this enormous loss could be avoided? The first remedy that suggests itself are covered barnyards; but then comes the trouble of excessive fermentation, which, however, can in part be prevented by thinly spreading and allowing the stock to tramp it firmly in their daily exercise.

As an absorbent in the stable, in our own practice I find, the finer the material, whether straw or cornfodder, the better the results. It is our practice to cut all cornfodder and feed liberally; the refuse is sufficient to keep stock clean, and, in addition, the manure is in splendid condition to apply at once to any growing crop. That circumstance will permit its immediate application. In conversation with many farmers upon this subject, I find some of them have been practicing the habit of cutting their straw, not only for its convenience and value as an absorbent, but that it can be more economically used, as it takes less storage capacity and is in condition to apply on the fields and be no hindrance in the future cultivation of their crops. I also find, since we also cut all our corn fodder, we have an excellent material, acting like a sponge, as it were, in taking up liquid materials in our stables, which are, in a great measure, allowed to escape, either by soaking away through the soil, or run off upon the surface as objectionable, offensive matter.

Now, brother farmers, the time has come, if we are to be the successful farmers of our boasted State, to utilize all the offal matter from our domestic animals, and the house as well; to husband all the fertilizing ingredients that it is possible to accumulate upon our farms, and provide methods that will retain the greatest possible amount of their valuable elements, and apply them to the fields in such available form that the subsequent crops can derive the most benefit therefrom.

The liquid element from both house and barn, being in a soluble condition, are immediately available as plant food, or to be absorbed by the soil. In order to utilize all that it was possible to collect at our place, I buried a large oil barrel in the ground just outside of the cow stable, made a drain with plank behind the cows, and collected all that was possible in that way. To my great surprise, the barrel was full much sooner than expected and the contents of much greater strength than I anticipated. The tank from the kitchen, where all the dish water, etc., emptied, was close beside, and I found, by a few experiments, that by diluting that from the stable with half of that from the house, the effect of its application to growing crops was much better, the former being too strong when applied alone. So well am I pleased with the results that we have provided a light, convenient hand vehicle, into which the liquid can be pumped, of any de-

sired strength, from the two tanks, and applied by a sprinkler to the garden, lawn or vineyard with very little labor, and as fast as desirable, without handling this highly fertilizing, yet offensive matter. Now, if it is possible to collect this matter and apply it in a small way, it can be done much more cheaply, proportionately, on a large scale; and I fully believe that if our farmers would avail themselves of what is usually wasted by leeching and running off upon the surface to an adjacent stream, they could procure a better fertilizing material than is found in the best commercial fertilizer upon the market, and the thousands of dollars that are now spent would remain to their credit in their bank accounts.

The common practice of farmers in my vicinity, is to apply their barnyard manure twice a year to such fields as they desire to plow for a succeeding crop. This method has been pursued as far back as I can remember. After spreading, the field is most likely plowed with a jointer plow, and the manure turned in a small, narrow row in the bottom of the furrow, and there be expected to produce a good crop.

The feeding roots of most farm crops are near the surface of the soil, and all fertilizing matter, to be immediately available, should be in a position where the small, tender rootlets could absorb such matter as the plant required, but the common practice of plowing it down, as above described, most certainly buries a large proportion of it beyond the reach of the crop for which it was intended. With the proper preparation of the manure as described in the first part of this paper, and about one-half, or even less than half of the amount applied, recent experiments at home have convinced me, will produce better results and keep the soil in a much more friable condition, thus getting the benefit of its fertilizing properties, as well as the mechanical effect it has upon all clay soils.

In the general discussion which followed the reading of the essay, Mr. Cooper added the following verbally:

The liquid element from the house and barn are undoubtedly the strongest in fertilizing matter, and if you can husband their collection and keep it in available form, it is ready to apply at all times, excepting in severe weather. You should take the care and pains to prevent its waste and you will be astonished at results. How is it done? In my own case, I conceived the idea of putting a drain behind my cows and planting a tank immediately outside the building, and I was astonished to see how quickly the tank was filled. The implement used to put it on the soils is a very simple one; I had made, several years ago, what you might call a two-wheeled handcart. I went to our blacksmith and told him that I wanted a pair of wheels and axle, and told him to bend that axle down to within six inches of the bottom of the wheel, on which a barrel is used, leave the one head of the barrel out, and into that I pumped the liquid. A good man can distribute it over any low growing crop, and the results of its application are astonishing. I might say that the vat that comes from our kitchen lies right beside it, and I find it necessary to dilute it about one-half, and get good results. I feel thoroughly convinced that this liquid can be applied so cheaply that no farmer can afford to let it escape. I believe it will reimburse you for the labor, and put more money in your

pocket than you are expending for commercial fertilizers. I have used several brands of fertilizers in my time, and I am sure that I can do this with more satisfaction than I can with the best fertilizer that is on the market. As it can be done in a small way, so more easily may it be done on a large scale.

Now, the application; surface application, at any time after hay-making, to your grass plots, can be made to a very great advantage. If farmers who pursue hay gathering as an industry would watch their grass fields and apply it on the poorer plots—if they did not have sufficient for the whole field—they would soon notice the good results by putting a liberal supply over those spots—these are the places that should be looked after first. In a week's institute work with Mr. Terry, of whose writings you have, no doubt, read a great deal, and some of you heard him, or heard of him, this is a point with him. So faithfully does he carry it out that when he is cutting his grass he marks the spots, and just as soon as the hay is taken out the manure goes out on to these spots. Of his success as a farmer, I need not say a word. We expect to have him with us this winter. In the application as a fertilizer material to your corn field, I would say that, in a conversation a few days ago at an institute in Berks county, I had quite a talk with one of the best and most progressive farmers there, and I spoke of surface application. He said, "Oh, yes, Mr. Cooper, I have a very forcible example of the value of that, which occurred quite recently." I refer to Mr. McGowan. He said, perchance we covered a field of timothy sod, I think he said, but on a part of it we did not have enough to cover it when we plowed it, and the whole was plowed; but, prior to planting, this spot that had not received any was covered over with about the same quantity that had been applied on the other. The result was that through the whole season, after the first two or three weeks, he could see the plot that had the surface application way ahead, and by the time he harvested his crop he had about one-third more corn there than where it had been plowed down. Another very successful farmer of my own county, in speaking of the jointer plow and surface application, said that the jointer plow was the curse of the farmer. Just think for a moment in what position your surface manuring goes! This jointer plow turns a narrow furrow, laps half the furrow over, lays it in a narrow row. The main plow turns the whole and puts it upside down in the bottom of the furrow. Now, where are the feeding roots of your corn? Have you ever noticed they are close to the surface? Now, all the application of this manure plowed down is lying beyond the feeding roots of the plant, and you get no benefit from it. In my own practice, I find the best results from surface application. I can see to the very row across the field that had the surface application; for it will be higher and the ears much larger. From actual tests (this is no theory) it is practical; in addition to that, in the last two summers, and they have been dry seasons, I have had good patches; that which had the surface application scarcely wilted, whilst that where I plowed down wilted and was checked in growth. Our people plow four to five inches deep in our county.

G. HOPWOOD, of Fayette. I don't know how deep the roots go in your soil, but my experience is that they go down eight inches in our soil.

MR. COOPER. I think you are mistaken. They will not go down that

much, where we have a clay soil as a sub-soil. I have examined in our soil numbers of times, and I have never seen what I supposed to be feeding roots more than five inches deep.

MR. HOPWOOD. How deep do you run your furrow for planting?

MR. COOPER. Not more than four to five inches. The feeding roots are only made after the corn is up three or four feet, and then they are out all through the soil, permeating every direction. I will tell you what led me to see the advantage of surface application: By accident, we applied a little in our corn field and cultivated the corn; I found these little fibrous roots matted in these little particles of manure. They would come up under the soil and fill it full. On close examination, I found the fibrous roots come out on the surface and turn back again, permeating every part of the soil, the soil being literally filled with fibres. Knowing they were seeking food near the surface, I determined that if that was the way the plant lived, it wanted its nourishment near the surface.

W. C. SLOAN, of Westmoreland. By that system of farming, how many bushels do you realize per acre?

MR. COOPER. The farmer who said that the jointer plow was a curse to the farmer, has grown 117 bushels of shelled corn to the acre.

MR. SLOAN. What can you grow on your own particular farm?

MR. COOPER. We think we do not get a good crop if we don't have 75 to 80 bushels every year.

McCREARY, of Lawrence. Isn't it a pretty good way to have your land in shape to grow your corn without manuring?

MR. COOPER. We can't always do it. The great trouble in our country is that where land sells at \$150 to \$200 per acre, we are taking off all that we can get. On my way up here I had a little talk with a gentleman who accidentally made the experiment with wheat. He said that, after having prepared his wheat field, he had one load, and put it on his wagon and took it out and spread it with a shovel off his wagon; and, wonderful to say, when the wheat was cut the following year, at the very spot where he had thrown the manure off with the shovel, there was a tremendous setting of young grass.

D. KISTLER, of Perry. There is nothing that has worried me more than to see the leeching away of manure. It is a waste, and has been going on at an extravagant rate, and must be stopped. We are losing as much as 80 per cent. of the essence of our fertilizing property. The only thing to do is to haul it out as it is made, before it has a chance to leech. I haul all out before it accumulates; about the time there is danger of its freezing up, I take every pound and scatter it over the land. But care must be taken that we do not put it on hilly land, where there is a likelihood of its washing away before it becomes a benefit to the soil. It is a shame that we are not more careful of this most valuable fertilizer, and thus prevent its useless waste.

PRACTICAL ROAD-MAKING.

By JOEL A. HERR, *Member from Clinton, Cedar Springs, Pa.*

(Read at Montrose Institute.)

The subject of road making is one of the deepest interest to every citizen in this community. Good roads are desired by every one, and may be said to mark the stage of civilization reached by the community through which the road passes. Good roads govern, to a marked extent, the value of the property they traverse; hence all property owners are especially financially interested in the maintenance of good roads. In these days of steam and electricity, the public mind is directed especially to faster means of locomotion than our common public roads. The railroad and electric roads are studied and built to the neglect of our more common roads. And yet, when we consider that the average farmer travels ten miles on our public roads to every one he travels on railroads, and that he spends fifty hours time on public roads to one on railroads, the vast importance of the condition of the farmer becomes painfully apparent.

It is not the purpose of this paper to treat the subject of road making scientifically, or of specially advocating any new theory of the subject, but more particularly to point out how our roads may be improved with the laws as we have them, and the means we can have at our command. The matter of road legislation we will leave to be handled by persons better versed in law making. We will not presume to go into unwarranted extravagances in the interest of bicyclists or bicycle manufacturers, yet we must acknowledge that they have both done us great service by agitating the road question, bringing prominently to our notice the bad condition of our roads and the means for their improvement. The bicyclist feels on his own person, while riding, the roughness and bad condition of the roads, while others, riding in vehicles, feel it less; the jar and shocks received being principally felt by the horses attached.

The farmer complains (and justly, too,) of having to bear an unjust share of the burdens of government in the shape of taxes; and yet all his other taxes added together will not equal the burden of taxes he bears by being obliged to travel over the rough, hilly and muddy roads so common in many parts of our country. Not only is it a tax in the monied sense of the term, but it is a tax on his time, his patience, and even his morals.

Then let us consider whether the taxes borne by being obliged to travel over bad roads, equals those of making good roads.

We cannot expect to pass from a condition of bad roads to the opposite condition of good roads at one stride. It will require time, education, money and labor. The matter of education in road matters must come first. When we are made fully aware of the burdens we bear because of poor roads, in the wear and tear of vehicles, the abuse of horses, the sacrifice of time in transit, the reduced size of the load we are able to draw, the disadvantage of being unable to travel except at special times, and the annoyance of rough and muddy roads; then are we in a condition to seriously consider how to remedy these wrongs and lighten the burden, and are ready to act accordingly.

The first important step in having good roads is in properly surveying or laying them out so as to avoid steep grades. After a road is once built, it is very hard to get the course changed so as to improve the grade or otherwise benefit it. As the weakest link in a chain tests the strength of the whole chain, so the steepest grade or hardest place in a road measures the burdens that can be drawn over the road.

The next important step is under-draining where needed, for a solid foundation. It is a waste of time and money to try to build a road through a low, marshy place before under-draining. Roads should be built slightly rounded, so as to allow the rainfall to run off quickly.

Where roads are much traveled, a stone road is a necessity, and where stone is easily accessible, it is the cheapest in the end, provided judgment is used in putting it on.

Crushed stone are better than pounded stone as they are apt to be much finer and can be more easily graded, and the small stone put on as a top dressing. Where stone are pounded, the top stone should be pounded finer than the rest, and after being used a few weeks should be gone over again and the larger pieces which work to the surface should be rebroken, and the loose ones gathered together and re-packed, or removed from the road altogether. Loose stone in a road are very hard on vehicles and teams. It costs too much to break or crush stone with the wheels of our wagons or carriages. This should be done with a crusher and then rolled with a heavy iron roller.

If people could be induced to use broad tires on their farm and road wagons, it would go a very long way towards the improvement of our roads. An abatement of a part of their road taxes to persons using broad tires might have a good effect.

As a part of the educational need of road making, it would be well to have experiments made with an instrument to test the draft required to travel rough, hilly or muddy roads, or freshly broken unrolled stone roads, and compare it with that on good, solid, well graded roads. By force of habit we become accustomed to traveling these bad roads, without stopping to compute their cost and inconvenience, like persons who live in malarial or ague districts who become so accustomed to their alternate daily shake, that they are disappointed if they miss it.

The selection of a competent person for road supervisor is a matter of the greatest importance. Good supervisor timber is hard to find, and when found, should be properly appreciated. The supervisor should qualify himself by a close observance of the condition of the roads and a study of the best methods of keeping them in repair, and of building new roads. He should be in touch with the most advanced thought in the line of his duties, and manifest it by bringing to his assistance the ripe experiences of progressive road builders in other sections of the country. He should have access to good road literature, so as to be advised of the newest and best implements for road making and how to secure them at the minimum prices. His judgment, skill and energy should command the respect and confidence of his fellows.

If these conditions are met, a long stride will be taken towards the cultivation of public sentiment in favor of good roads. The large amount of money necessary to grade and fully construct a first class road frightens the people from it. They have not fully considered the

fact that the cost of the labor which we are annually putting on our thoroughfares, aside from expenses necessitated by the use of bad roads, would pay a very large interest on the cost of constructing good roads. The question then confronts us, "How shall we obtain the funds with which to build good roads?" This is the all-important question to be solved in the development of any enterprise.

Upon the question of a cash or labor tax, the people in road districts are greatly divided. We will all agree that at least a part of our road taxes should be in cash, in order to enable us to purchase the necessary implements with which to work, and the material for bridges, etc. My preference is that it should all be paid in cash, subject to certain conditions, among which is, that the tax payers should have the privilege of performing the required labor on the roads, if they will do the work at the time when it is most needed, or when their labor will result in the greatest economy in making good roads; and further, that they will do as much work for the money expended as can be done by procuring other hands. This would virtually be the same as our present system, except that loafing out the road taxes by leaning on shovel handles, and sending the weakest, most worthless hands to work on the roads, would practically be abandoned. Our road taxes could then be made at least one-third lighter than they now are, to accomplish the same amount of work.

It is not a difficult matter to obtain money for investment in any community if we can show that the investment is perfectly safe and will pay a fair interest. When the people are convinced of the economy of building good roads (which can, and should be demonstrated by actual experiment), there will be no lack of funds. Let every township or borough make the experiment of putting a small portion of their most traveled roads in first class condition, keeping a close and correct account of the cost, and also the cost of keeping the same in repair for a few years and continue to do so, year after year, until the experiment is thoroughly tried, and I am convinced the public good will be subserved and the taxpayer will be satisfied with the investment.

In localities where stone are easily accessible and do not require to be hauled more than one mile, by the use of the proper machinery, a good, substantial macadam road, 16 feet wide, can be built not to exceed \$5 per rod, or \$1,600 per mile, which would last for many years without any repairs. The interest at six per cent. on this amount would be \$96, which amount can easily be expended annually in keeping a mile of bad road in repair and still have a bad road all the time. I do not desire to urge townships to go largely into debt to maintain good roads, yet it might be economy in the end to do so. The safer plan is to levy the amount of taxes which the taxpayers can pay without severe oppression and use them as heretofore suggested.

Aside from the amount of money in taxes saved in the aggregate by making first-class roads, if we will fairly consider the following named advantages gained, the balance will be overwhelmingly in favor of the good roads.

Let us recapitulate: By maintaining good, solid, smooth macadam roads, we will be enabled to save one-half the time spent in traveling; to travel at any time of the year; to haul twice the burden with the same power; to save much wear and breaking of vehicles; to take better care of horses and require a less number. Then the increase in

the value of property through which the road runs, and last, but not least, the thrift that comes to the whole community from these lessons in political economy and business practices, are considerations of the highest value.

If there is any one thing in the highly civilized countries of the old world which we might justly envy, it is their system of good roads.

As we reach a higher state of education and civilization, it will be manifested in our systems of road making. We are fast approaching the day of liberation from bad roads. The law makers of our State are deeply exercised over road legislation. Corporate property will no doubt be asked to contribute its share of funds for the purpose of road building. Why should not the railroads of our State contribute largely to this fund, inasmuch as public roads are but so many feeders to their lines? We must never cease to agitate the question, and by our words, our works and our votes, contribute to its progress.

"Let us then be up and doing,
With a heart for any fate;
Still achieving, still pursuing,
Learn to labor and to wait."

DISEASES OF DAIRY COWS.

THEIR PREVENTION, TREATMENT AND CURE.

BY THE SECRETARY.

It is perfectly safe to assert that seven-eighths of the diseases to which dairy cows (and other farm stock) are liable, are the direct and legitimate results of bad management, improper feeding or want of proper shelter and care. It is further quite as safe to assert that two-thirds of the work of the Veterinary Surgeon of the Board of Agriculture, and of its Secretary, so far as diseases of animals are concerned, are directly due to the want of a proper and reasonable knowledge of the diseases of animals and their treatment, and that in one-half of the cases in which the services of the State officers are required, a limited knowledge of diseases, with an even more limited knowledge of the manner of diagnosing them, might have rendered the services of the officers unnecessary.

A few illustrations will suffice to make the point clear. The Secretary of the Board was called upon to visit a dairy in York county in which some "unknown and evidently highly contagious disease" had broken out. His examination clearly proved that the animals had been eating improper food in large amounts, and yet the owner was positive that such was not the case, and reiterated the statement in spite of all suggestions to the contrary. The proper remedies were at once applied and as soon as their operations commenced, the animals voided whole wheat in large amounts. When shown this verification of the statements of the State officer, the owner admitted that the

animals had gotten out of the yard, and getting into the barn floor, had eaten wheat from a pile; but he claimed that the amount thus eaten was not sufficient to produce the alarming symptoms which he had diagnosed as a clear case of contagious pleuro-pneumonia.

In another case, in the same county, a farmer had, since the opening of spring work, lost five horses by a (to him) mysterious disease, and the whole neighborhood was so alarmed that they would not bring their horses near the barn or buildings.

The Veterinary Surgeon of the Board diagnosed the case as one of ordinary cerebro-spinal meningitis, and a post-mortem of an animal which had died just previous to his arrival, corroborated the diagnosis. Knowing that this disease was usually caused by improper food, a careful investigation of the hay mow and meal chest was made, but no apparent cause could be discovered until he asked to see the bin in which the supply of oats for the farm horses was kept. This was found to be against the outer weatherboarding of the stable, against which the storms beat during the whole year. For eight or ten inches from the back part of the bin the oats was found to be damaged, and an examination under the microscope clearly revealed the fungoid growth on and among it, and the cause of the disease was apparent.

In another case the State officers were called to a distant part of the State by the excitement which followed the outbreak of "what was supposed to be a highly contagious disease among cows and calves." An examination clearly proved that bad food, in limited amounts, with the presence of lice in large numbers, had been responsible for the death of not less than ten animals on the same farm.

We might readily add to this list, but we have given sufficient to prove the point we wish to make, which is that farmers and stock owners should know enough of the diseases to which their stock are liable, to be able to know whether the special disease is one of the digestive organs or one of the respiratory organs; to be able to know something of the results of a certain course of feeding and treatment, and to understand that the laws governing health in animal life are just as rigid as those which govern the health of the human family, and to properly realize that one set of laws cannot be violated with impunity any more than the other; that, in fact, to take the advice of Jethro Tull, "they must treat their brutes like men," and fully realize that they are, at least to a certain extent, amenable to the same laws of health as their owners.

MILK FEVER, PARTURIENT APOPLEXY, PARTURITION FEVER.

This foe to heavy milkers is usually due to costiveness and plethora, and, naturally, attacks heavy milkers rather than those which take better care of themselves than do their owners. Its attacks usually follow anything in the nature of nervous excitement or unusual excitement, and as a natural consequence we usually find it with heavy milkers just after calving. The change of a large amount of blood from foetus, which until calving, the dam has been carrying in her own system, and the excitement and nervous prostration which always follows calving with heavy milkers, gives exactly the condition for attacks of milk fever, and if this condition is further

supplemented by a high temperature, the effects and results are only the more certain and dangerous.

Realizing that the disease is often due to too high a condition of the system, the dairymen keeps his cows upon short rations for a time before calving; if she is upon good pasture she is fastened up in the yard or stable and fed upon dry hay, and, by the very precautions which he has taken, the owner has caused a condition of affairs which naturally brings about the very disease he has striven to avoid. Want of exercise and dry feed bring on costiveness and this, of itself, is the cause of very many cases of milk fever.

At any time all changes in diet should be made gradually and carefully, and at no time is this more essential than just before calving. Rather than make any sudden or radical change in the feed, better let the animal take her chances where she has been, and run no risks other than those which naturally surround such cases.

As a preventive, bring the animal into the open yard; give her freshly cut grass in moderate amounts, supplemented with dry hay; see that she has plenty of cool water and that the dangerous constipation is not caused by a want of water at a time when it is most needed. Small amounts of bran may be fed with the other food so as to counteract the effects of the dry feed, but if the animal is in good condition, it is safe to feed nothing but grass and hay, and these in limited amounts.

Dr. Bridge, the Veterinary Surgeon of the Board, gives the following advice as to the prevention and treatment of cases of "milk fever."

"The best treatment is in the direction of prevention. This can be accomplished by regulating the feeding prior to calving, by giving such kinds of food as will keep the animal in good working order without putting on too much fat. Corn or corn meal should never be fed for two months prior to calving; crushed oats in small amounts may be substituted, and will keep the animal vigorous and in good health.

The habit of giving the cow a bucket full of warm water with bran or corn meal, as soon as she has calved, is not only not necessary, but may produce the disease which we so much desire to avoid, especially in plethoric cows which are deep milkers.

After parturition, the nutrition which the calf has been receiving, must now enter the circulation of the mother, and if she is a rich and deep milker, the fat has reduced the capillary force, which should now be active to produce extra secretion, as the circulation is overcharged. The sudden addition of warm, rich and nutritious liquids is thus given at the worst possible time, and is no doubt a prolific cause of milk fever.

Sudden change of food should at all times be avoided, and especially at the time of or after calving. For the first three days the animal should be sparingly fed and brought up to her full rations gradually. For animals whose condition would indicate danger of the disease, I would advise giving an ounce of saltpetre every two or three days for a short period before calving; where this treatment has been adopted I have never known a case of milk fever.

In the treatment of this disease, a good nurse is of as great importance as the veterinarian, for unless the instructions of the latter are faithfully carried out, the result will most likely be unfavorable.

If costiveness is indicated, the arm should be well greased and in-

serted in the annus and the faeces carefully removed, and the urine carefully drawn off with a catheter twice each day. Cold clothing or ice should be kept to the poll, and the animal kept as much as possible in its natural laying position, with the head supported with bags of hay or bran.

Counter irritants should be applied to the spine; for this purpose equal parts of linseed oil, aqua ammonia and tincture of arnica may be mixed and applied from the shoulders to the tail; the application may be advantageously made three or four times each day.

Keep the animal reasonably warm with blankets and draw off the milk twice or oftener each day. On no account should the animal be allowed to lay broadside, but if possible it should be kept upon its breast, and in its natural position as much as possible."

In referring to the probable effect of constipation in producing milk fever, Prof. Walley writes as follows: "Reasoning analogically you must all have, at any rate those who have suffered from this unpleasant affection, been struck by the painfulness in the vessels of the head in endeavoring, by violent efforts, to expel hardened faeces from the rectum; and this straining has been frequently the cause of cerebral apoplexy in the human subject. How much more injuriously then must it act in an animal with such a large stomach as the cow, especially if superadded to this pregnant condition? And in old animals, you must bear in mind, this is intensified, as in them all the hollow viscera become more voluminous, and there is greater probability of organic disease existing than in younger animals."

In alluding to the fact that the tendency to milk fever may, apparently at least, be transmitted by heredity, Prof. Walley writes thus: "Anatomical confirmation, as in animals having short cervical vertebrae and being very round in the barrel may be transmitted, and in this way the hereditary tendency may be transmitted, the tendency becoming increased by multiplied consanguinity in the same way as seen in other affections in which the tendency is hereditarily propagated."

Dr. Hill calls attention to the fact that he has very many more cases among cows with their third calf than at a later period of their lives, and that cases with the first or second calves are very unusual, and he attributes this to the fact that "the vascular system is not replete, and the lacteal secretion is not so great at the two births as at the third and fourth."

Dr. Law gives the following as the symptoms: "Dullness, languor, uneasy movements of the hind limbs, a full, bounding pulse, red eyes, hot head and horns; soon the cow becomes weak on its limbs, unable to rise, lays the head back on the flank or dashes it on the ground, breaking the horns if the surface is hard, and struggles convulsively with its limbs. The surface may now be bedewed with perspiration, the eyes red, fixed or rolling convulsively, the pupils dilated, the heat of the head still greater and the pulse quicker and weaker. Sensation is completely lost, the skin may be pricked at any point without the slightest response and the eyeball touched without causing winking. Neither dung nor urine is passed, the intestines and bladder also being the seat of paralysis or stupor."

The careful dairyman will always closely watch his cows as they are expected to calve, and a half hour may be of the utmost importance in cases of milk fever; a remedy which produces no effect

might have been successful a half hour before, and if we wait for the veterinary surgeon, the animal may be lost or, at best, his labors when he arrives will be greatly increased and his chances of success greatly diminished.

Some authorities strongly recommend bleeding, but this, if practiced after the animal is down, very often but adds to the dangers which surround the case; if resorted to while the animal is showing the early symptoms of the disease it is undoubtedly beneficial. Upon this point our authorities differ and we believe that it is best, in all such cases, to avoid the danger by only resorting to the practice upon the advice of a well qualified veterinarian. Youatt writes of this disease: "The disease is an inflammatory one and must be treated as such; therefore the patient should be bled." Dr. Hill, in commenting upon this statement of Youatt's, adds: "Now, It does not necessarily follow that because a disease is inflammatory, blood should be drawn. Parturient apoplexy, moreover, is not an inflammatory disease; yet granting it were, a line must be drawn as to the practice of venesection. Bleeding must depend upon the condition of the pulse, the degree of fever and general symptoms." Mrs. Partington once gave the advice, "when in doubt as to where to go, remain where you are," and we can but repeat it in the present case; if in doubt as to the propriety of bleeding, don't do it at all; and we will add, don't do it anyhow.

In a majority of cases the prime cause is costiveness, and therefore the first attention should be given to removing this cause, having found that it exists, as quickly as possible.

Dr. Law recommends two pounds Epsom salts, one-half ounce carbonate of ammonia and one-half dram of nux-vomica; the ammonia and nux-vomica to be repeated every four hours.

Dr. Hill prefers 30 to 40 drops of croton oil, well blended with one pint of linseed oil, and gives as his reason that the croton oil will act much quicker and that time is a very important item in the case. He cautions the person administering the dose to be sure that the croton oil is thoroughly mixed with the linseed oil at the time it is given, and not to be satisfied that it was thoroughly mixed when it was put into the bottle; the croton oil may float upon the linseed oil and in this way, coming directly in contact with the mucous membranes of the mouth, throat and stomach, cause irritation and give additional trouble.

As soon as the purgatives have acted, stimulating medicines should be given; one pint of brandy in one pint of water may be given; the spine should be well rubbed with ammonia and turpentine or, in the absence of these, with strong mustard water. The milk should be repeatedly drawn and this source of additional inflammation avoided; the head should be kept cool by the application of ice or cold water, care being taken that the water and melted ice does not saturate the straw and bedding upon which the animal is laying; if the animal becomes drowsy, dashes of cold water in the face and on the head are beneficial, and an occasional smell of strong ammonia acts as a stimulant to arouse. Dr. Hill considers the position of the animal important and strongly recommends that "her foreparts be a little elevated, and what is still more essential throughout the case, the head

should be kept well up. My own practice is to suspend it by means of a rope round the base of the horns (previously placing a swab or towel round) to a convenient beam, and by means of side lines to a head collar, she may easily be prevented from dashing the head around."

The writer, after considerable dairy practice, has never lost an animal with milk fever, and places great value upon the use of tincture of aconite in 30 to 40 drop doses, for a short time previous (a day or two) to calving, and to careful attention to diet for a still longer period previous to the time of greatest danger; this with close attention to the condition of the bowels, gives the owner a great advantage in the treatment of the disease.

There is scarcely a disease which comes within the notice of the veterinary practitioner which more clearly proves the truth of the old adage, "an ounce of prevention is worth a pound of cure," than milk fever, and as before stated, many cases now lost might be saved if the owner would only sufficiently study the disease of his animals so as to be able to act promptly while waiting for the surgeon to arrive.

GARGET OR CAKED BAG.

This disease arises from a number of causes, such as gores from other animals, kicks with heavy boots, bruises from any source or cause, careless or unclean milking, over-driving, especially when the udder is full of milk, and in some cases from an improper condition of the system of the animal. It is common just after calving, and this is due to the fact that the large amount of blood which has hitherto gone to supply life to the fetus, is suddenly diverted to the mammary glands which, in common with other organs, receive their proportion of the extra supply.

The ease with which this disease may be cured depends very much upon its being taken in its early stages, and 24 hours' delay may produce symptoms which will very much decrease the chances of a cure or increase the labor necessary to produce it. Care in removing every particle of the milk not taken by the calf, will do much to remove the chances of the disease; if, just previous to or during calving, the milk is carefully removed, one of the prime causes of caked bag would be removed entirely, and, some of our experienced surgeons claim, seven-eighths of the cases which follow calving would be avoided.

As soon as the existence of the disease is discovered, hot fomentations and poultices should be applied, and in all cases, every particle of the milk should be repeatedly removed; poultices of linseed meal, bran, oatmeal and boiled turnips, may be used to advantage, and if a few drops of laudanum or belladonna are added, it is all the better in its effects; if the inflammation is great, the milk should be carefully removed by the ordinary milk tube, and no dairyman should be without one or two of these, for, if used at the proper time, many stopped teats could be kept open, and a permanent injury avoided.

Dr. Law advises weak iodine ointment, "with plenty of elbow grease," and another eminent authority suggests that, in mild cases, a hungry calf is a valuable assistant. In very bad cases, Dr. Hill uses small doses of laxative medicine, and that in this, as in all other diseases involving inflammation, a loose condition of the bowels will ma-

terially assist the veterinary practitioner. The same authority recommends the following ointment:

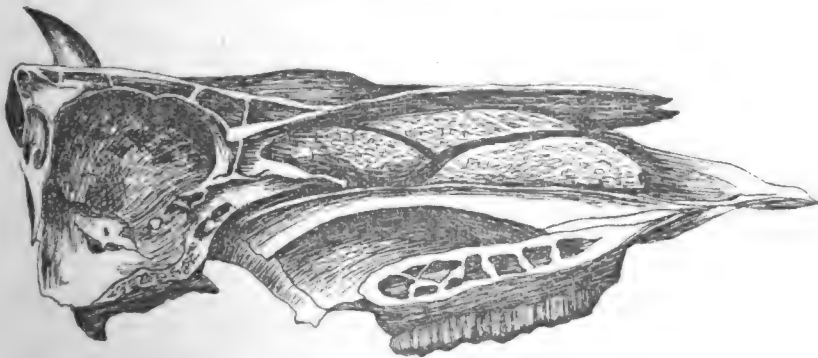
Vaseline, two ounces.
Soft soap, two ounces.
Camphor ointment, two ounces.
Iodine, one ounce.
Extract belladonna, one-half ounce.

This ointment should be applied and well rubbed in for five or ten minutes, at intervals, the frequency of which should be governed by the urgency of the case, and if to this is added a plentiful supply of "elbow grease," its efficacy is greatly increased.

CATARRH.

This disease, previous to the introduction of the improved knowledge gained at our veterinary colleges, went by the name of "hollow horn," and is simply a cold, usually of the mucus membranes of the nostrils, eyes, and head; the symptoms are trembling, flinching when pressure is applied to the spine, a dry nose, variable temperature of the horns and ears, pulse accelerated, breathing quickened, eyes clogged by yellow mucus, margin of the nostrils dirty, inner portions of nostrils more or less reddened, sneezing and coughing frequent. As the disease increases, all of the symptoms are intensified, and the mucus discharge become more yellow and finally offensive in odor.

In several cases which have come under the notice of the State officials, the disease, usually through neglect, has assumed a malignant form, and in a few cases, death has followed in a manner calculated to give the idea of a contagious disease.



Location of Catarrh.

The first treatment should be to produce (if it does not already exist), a laxative condition of the bowels; this may be by light and repeated doses of laxative medicine, but better still by the use of food consisting of warm water and bran, gruel of any kind, linseed meal, tea, or roots of any kind; this diet should not be stopped when the desired result is obtained, but should be kept up during the whole period of the cure; a sudden cessation of this kind of diet may bring about the very conditions which we wish to avoid, and which we are striving to

cure. In many cases relief may be afforded by holding a bucketful of hot water under the nose of the animal, and, if it can be done, by enveloping the head in cloths and thus giving the animal a warm steam bath.

Dr. Williams cautions the amateur practitioner against severe purgation in cases of catarrh, and on account of the danger in this direction, opposes the use of strong purgatives of any kind, preferring to rely upon laxative food, and, if necessary, injections of warm water, molasses, etc.

Neglected catarrh may run into serious disorders and takes different names, dependent upon the surface which is exposed; if the throat is involved, we have bronchitis, and if the lungs, certain forms of consumption.

PNEUMONIA.

Dr. Hill thus describes this disease: "The early stage is generally ushered in with rigors, followed by fever. The temperature is increased, the pulse accelerated, at first bounding; the respiration becomes quickened, there is an occasional short cough, the head is extended, the eyes red, the muzzle dry and hot, the tongue frequently protruded and slimy, the coat staring, the skin dry and harsh, and hide bound. The bowels are frequently constipated, and the urine scanty and high colored. The animal is stiff, and stands with the forelegs wider apart than usual.

Auscultation reveals a crackling or crepitating sound, which is circumscribed according to the amount of surface involved. This sound obscures, to a great extent, the respiratory murmur in those portions not diseased, and as the malady proceeds, this murmur becomes nearly altogether obliterated, the crepitus general and more defined, and the other symptoms all increased in severity."

Having reached this condition, the disease is ready to pass into its second stage, and if treatment and remedies have not been resorted to, the chances of recovery are then very much diminished. The second stage is thus described by Dr. Hill:

"The crepitus on auscultation is absent, and no sound, except there be a slight wheezing or whistling noise, can be detected; hepitization has then taken place, and inflation is only accomplished in a very small degree. The sound emitted on percussion, at this stage, is very characteristic of consolidation, being flat and dead. The cough is now frequent, painful, and accompanied with red or rusty expectoration; the eyes have a sunken appearance; respiration is performed with extreme difficulty; the cheeks are inflated in the act, the nostrils dilated, and the general expression haggard and indicative of suffering. The animal still stands with forelegs wide apart, to allow more room for the abdominal muscles to aid respiration. Or, very frequently in such cases, the patient assumes a recumbent position, lying on the sternum, for the same purpose. The pulse, at this period, has become small and varying, the head is hung nearly to the ground, the eyes are more blood shot, and the extremities alternately hot and cold. All the secretions are more or less suspended, particularly the milk in cows.

When the third stage arrives and suppuration commences, in other words, when the lung structure breaks down, auscultation discovers

a new sound—a bubbling or gurgling crepitation, caused by the passage of air through pus.

On placing the hands flat upon the side, much the same sensation will be communicated; it is as though fluid were boiling underneath, and I have been painfully struck with this phenomena in the human and animal subject.

The cough is now loose, and accompanied with copious expectoration; the mouth and lips are coated with sticky slime; the breath has a peculiar, foetid odor, and is taken at short gasps; the horns, ears and extremities are cold and clammy; the pulse is imperceptible. The respiration becomes shorter and weaker, the extremities and surface of the body become colder, the animal staggers and falls, and death closes the scene.

In all cases involving inflammation, much of the success depends upon the application of remedies in the earlier stages of the disease; if this is true of general inflammation of parts which can be relieved by rest, how much more important is it with organs which, like the lungs, can have no absolute rest, but which, no matter what the surrounding conditions may be, must keep up their action, even though it be in a less degree than is demanded by good health.

If pneumonia is not taken in hand before it has reached its second stage, there is very much less hope of ultimate success; and if it has passed into the third stage, a cure for it is out of the question, for, even though the animal should throw off the disease, the lung tissue, as far as the disease has progressed, has broken down, and can never be replaced by sound material; or, in other words, the diseased part never is capable of performing the functions of a lung again, and if in very large amounts, usually produces death by blood poisoning, or, if in small amounts, may be thrown off and absorbed into the system; in many cases the diseased parts are encysted, and are thus converted into foreign bodies which may be tolerated in the system, but which must always be a disadvantage and a danger.

One of the best remedies for pneumonia is probably to be found in counter irritation, which may be caused by mustard plasters, blisters, or a mixture of ground mustard and turpentine. The animal's heat should be kept up by warm water, hot woolen cloths, etc., at all hazards, for in accomplishing this lies the main chance of success and cure. Mild laxatives should be given and the bowels kept open, but these doses should in no case be sufficiently large to produce purging, which will cause a condition which the practitioner is trying to avoid.

Dr. Hill strongly recommends the use of stimulants, and suggests a half-pint of brandy or whiskey in a quart of gruel, twice or three times each day. Or, a mixture composed of two ounces of spirits of ether nit., mixed with one ounce of aromatic spirits of ammonia.

In administering liquids, especially in the second or third stages of pneumonia, the patient is often injured by the medicine getting into the lungs; inflammatory action along the trachea has so distorted and changed its conformation that the proper portions fail to act promptly, and the above results are produced.

SPLenic APOPLEXY.

The causes of this disease are, usually, a low and wet pasture, sudden change from a poor to a rich pasture, and, in some cases, to

pasturing upon very rich ground or upon soils made rich by heavy manuring. By far the most common cause is that of low and moist pastures during the hot weather of the latter portion of July, during August, and the first two weeks in September, and in every case in which the officers of the Board have been called upon to investigate outbreaks of this disease, its ravages have been stopped by the removal of the animals to high and dry pastures.

The symptoms are somewhat uncertain and death follows so quickly that symptoms are not observed; in some cases, animals which were apparently healthy at night are found dead in the pasture in the morning. In other cases, and under other conditions, the approach of the disease is slow, and even the casual observer will have time to note the peculiar symptoms of the disease; usually, however, several animals are lost before the owner's attention is directed to the fact that anything general is wrong. Flemming thus gives the symptoms in cases where the outbreak is in the milder form, and in which some time elapses before the more dangerous symptoms set in.

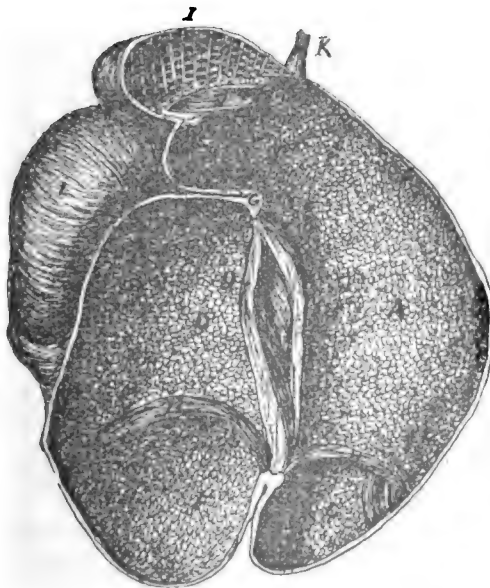
"There is a cessation of rumination, and loss of appetite; weakness or prostration ensues, with stupor or great excitement; shivering, and general or partial sweatings appear; or the skin, which is harsh and dry, is hot and cold alternately; tremblings manifest themselves; along the spine and ribs, the pressure causes pain; the muscles in some regions, especially those of the neck, contract spasmodically, and these contractions are often accompanied by plaintive lowing; the contractions become more marked as prostration increases; if the animal is made to move it staggers and stumbles, and progression is nearly impossible; it often falls, and has great difficulty in getting up. About this time a foetid and sanguinulent diarrhoea sets in, accompanied by abdominal pain, which the animal indicates by frequently looking at the flanks. The expression is that of stupor, and the dull, dead appearance of the eyes is characteristic; at the same time, the heart beats are loud and tremulous, and the pulse is small, very quick, and irregular; the temperature of the body may be very high, but the legs and face are cold; the respiration, at first sighing and plaintive, soon becomes panting; the muzzle is dry, and the mouth cold and filled with foamy saliva; the tongue is pendent and violet colored, the buccal membrane yellow, and the animal grinds the teeth; the conjunctival membrane is of a black or reddish-violet hue; the eyes appear to protrude more than usual beyond the orbits, and the pupils are dilated; the abdomen becomes distended, the animal falls, blood flows from the nostrils, and the foam from the mouth is blood colored, and convulsions, especially of the limbs, commence, and in some animals are so severe that it is dangerous to go near them. Usually, however, the prostration is extreme, the body cold, and the animal either perishes during one of these convulsive attacks, or it may be in the calm which succeeds it."

Death may ensue before the attack has attracted the eye of the owner, or the animal may linger for 36 hours, but seldom longer. In several cases in which the Surgeon and Secretary of the Board were called in, two or three cows were dead before the outbreak was noted; they had been turned out in the morning apparently well, and were found dead during the afternoon. In a few cases which have been brought to our notice, the animals have lingered for three days, but in no case have we noted a longer continuance than this.

The disease is so rapid in its action, and so tenacious in its effects, that no general course of treatment can be suggested, and when called upon to examine such cases, the Surgeon of the Board usually does little beyond recommending an immediate change of pasture to high and dry localities, or a few days confinement in the yard or stables; in every case this has checked the outbreak, and in many cases has checked the disease in animals in which it had not reached its worst stages, and in which the attention of the owner had been directed to the health of his animals by the sudden death of one or more.

Dr. Hill cites the case of the outbreak of this disease among the deer in one of the large English game parks, in which the cause was undoubtedly to be found in the fact that the animals had access to and drank from the pools which collected at the outlets of the sewer pipes leading from the residence into the park; at least, the outbreak was stopped as soon as these pools were fenced in, so that the deer could not gain access to them.

TYMPANITIS—HOVEN.



THE STOMACH; location of tympanitis.

Some authorities claim that this trouble of the dairyman should never be classed as a disease, but always as the result of accident or improper feeding. However correct this may be in a majority of cases, the writer has met with a number in which it was clearly the result of disease following indigestion, and in which certain animals were quite often "bloat," without any change in the kind or quantity of their food.

The effect which we know as "bloating," or hoven, is due to the retention of the food in the rumen until gases are generated, and un-

til finally the opening leading from the rumen is closed by the expansion of the adjacent parts, and the animal is unable to relieve itself in the usual way. In the horse this is often caused by rapid eating after a hard drive or a hard day's work. In ruminants it is usually caused by too rapid eating of succulent food, or too sudden changes from one kind of food to another. The writer has repeatedly been called upon by Lancaster county farmers to examine cases of supposed Texan fever, or other contagious diseases, when the real trouble was caused by the retention of a large mass of food in the rumen; the animals, hungry as they came from the car, were turned out, in September, into old timothy pastures or into pastures with dead or ripe grass,

and, having filled themselves without properly moistening the food with saliva, impaction sets in, gases are formed, and swelling and, in some cases, death follows.

Flourens claims that this too rapid eating is the cause of very many cases of hoven, and that even with succulent food the trouble is due, not to the character of the food, but to the fact that it is swallowed so rapidly that saliva is not mixed with it in proper quantities.

The great difficulty in the way of treatment is the fact that usually the swelling produced by the accumulating gas prevents the entry of medicine into the rumen and permits it to pass onward into the digestive stomach, and no effect is produced in the rumen.

Veterinarians usually recommend cathartics, provided the swelling has not progressed so far as to render their action uncertain from the causes given above. Dr. Hill recommends the following: "In very urgent cases the most effectual treatment is that of puncturing the rumen with a trocar, and allowing the gases to escape through the cannula. The operation is to be performed in the most prominent part of the swelling, and at equal distances from the spine of the ilium, last rib, and transverse processes of the lumbar vertebrae. When the symptoms are not very urgent, tympanitis can be relieved by stimulants and stomachics, such as carbonate of ammonia, turpentine, alcoholic preparations, or vegetable spices, particularly if given in warm ale. After the symptoms of urgency have been removed, cathartics are to be prescribed, such as salts, with croton oil and aromatics, care being taken that the animal be kept upon a restricted diet for some days after recovery. When tympanitis becomes chronic, stomachic stimulants, particularly nux-vomica, are to be prescribed; but if, along with attention to dieting, they fail to give relief, it may be necessary to open the rumen, when the cause may be detected and removed."

HOOF-AIL, OR FOUL-CLAW.



The cleft of the foot.—Location of hoof-ail.

This trouble of the foot is usually due, primarily, to the presence of some foreign body between the hoofs, or to some wound or blow in the region affected. A small stone may bring on a case of hoof-ail, especially in the working ox. Tramping through mud or water is another prolific cause, and hence we usually find the disease more frequent during wet seasons or during the winter or wet portion of the year.

Permitting the stock to run in the corn field, after the stalks and fodder have been removed, is another prolific cause of this trouble, and if the stubs have been cut, the danger is greatly augmented by the sharp, standing stubs left close to the ground. Standing for any great length of time upon heated or decomposing manure, especially in the stable, will, in very many cases, cause this disease and produce it in one of the most difficult forms to cure.

Referring to this disease, Dr. Hill writes thus: "Probably the most



BONES OF A COW'S LEG.

frequent cause of foul-claw is the irritation produced by the presence of foreign bodies between the claws. Certain constitutional conditions, however, also favor development; thus, we find it an accompaniment of rheumatism and scrofula."

In alluding to the most violent forms of the disease, Prof. Williams writes: "This affection is, within my experience, confined to horned cattle, where the process of "in and in" breeding has been carried out to too great an extent. The joints usually affected are the elbow and stifle, and the foot-joints, as in the disease called 'foul in the foot.'"

Dr. Law gives the following as causes: Wearing the sole to the quick from long journeys on hard roads, curling in of the overgrown walls on the sole on soft and boggy pastures, wounds with sharp bodies, like nails, glass, etc., the accumulation and drying of clay or mud between the claws, softening of the horn from standing on hot, reeking manure, irritation of the skin around the cornet by ice, water, etc.

Mild cases usually give way to washing with soap and water, and the use of clean grease of any kind; the more extended forms, however, require more vigorous treatment, but in all cases the first efforts should be to ascertain and remove the cause, for until this has been done, there is but little hope of a permanent cure.

Dr. Hill recommends a poultice of hot bran and linseed, mixed with charcoal; every time the poultice is removed the claw and foot should be thoroughly washed with warm water, and the animal carefully kept in a perfectly clean place.

As a dressing, Dr. Hill recommends the following:

Crude carbolic acid, one part.
Tincture of myrrh, two parts.
Tincture of arnica, two parts.
Glycerine, four parts.

This mixture to be applied directly to the parts affected, after they have been well washed with warm water. If applied to a piece of tow, and bound into or between the claws, its effect is all the better. Dr. Hill strongly condemns the practice of "drawing backwards and forwards over the sensitive surface a piece of tarred rope; not only does such an operation inflict sad and unnecessary torture on the animal, but it exposes the ignorance and brutality of the operator, and adds one more link to the chain of empirical absurdities."

Dr. Law strongly recommends the use of a bandage, well smeared with tar, and bound around the cornet and into the cleft of the foot; if a few drops of sulphuric acid have been dropped on and incorporated with the tar, its effect is increased. Dr. Law also recommends the use of a solution of sugar of lead in bad cases, which refuse to yield to other treatment.

In all recommended cures, the utmost cleanliness is an essential point, and unless the foot and hoof are well cleaned and washed, nearly all of the cures will fail; and with this assistance most of them will prove effectual, especially if taken in time.

BOUNTIES TO AGRICULTURAL SOCIETIES.

BY DR. J. P. BARNES, *Member from Lehigh, Allentown, Pa.*

The first section of an act to establish the State Board of Agriculture, passed May 3, 1876, and approved by the Governor, May 8, 1876, reads as follows:

"Be it enacted, etc., etc., That the Governor of the Commonwealth, the Secretary of Internal Affairs, the Superintendent of Public Instruction, the Auditor General, the President of the Pennsylvania State College, and one person appointed from or by each agricultural society in the State, entitled under existing laws to receive an annual bounty from the county, and three other persons appointed by the Governor, with the consent of the Senate, shall constitute the State Board of Agriculture."

This section stipulates quite plainly what persons constitute the membership of the State Board of Agriculture. Five State officials are designated, with power extended to the Governor to appoint three additional persons, with the consent of the Senate, with the additional appointment of one person from or by each County Agricultural Society, entitled, under existing laws, to receive an annual bounty.

The membership of our present State Board of Agriculture consists of about sixty members, five of which are specified by the act, three appointed by the Governor, and fifty-two, more or less, are appointees sent by the different county agricultural societies throughout the State.

To ascertain by what authority these different county agricultural societies appoint their representatives to a membership in the State Board of Agriculture, it becomes necessary to refer to section fourth of an Act approved the 29th day of March, 1851, incorporating the Pennsylvania State Agricultural Society, which reads as follows:

"When any number of individuals shall organize into an agricultural or horticultural society, or any agricultural or horticultural society now organized in any county, in this Commonwealth, shall have adopted a constitution and by-laws for their government, elected officers, and raised annually, by voluntary contribution of its members, any sum of money which shall have been actually paid into its treasury, for the purpose of being disbursed for the promotion of agricultural knowledge and improvement, and that fact be attested by the affidavit of its president and treasurer, the said county society shall be entitled to receive annually, a like sum from the treasury of the county: Provided, That said annual payment from the county funds shall not exceed one hundred dollars: And provided, That but one such society in any one county, shall be entitled to receive such appropriations in any one year under this Act."

We hereby learn that a number of persons shall organize themselves into an agricultural society, or such a society already organized within any of the counties of this Commonwealth, that shall have adopted a constitution and by-laws for their government, elected their officers, and raised annually by the voluntary contribution of its members, any sum of money, which shall have been actually paid into their treasury

for the purpose of being disbursed for promotion of agricultural knowledge and improvement; therefore, the first requirement is that such society must be fully organized for disseminating agricultural knowledge and improvement.

Now, the question arises, what is agricultural knowledge and improvement? Is it not the art or science of cultivating the grounds, especially in fields, including the preparation of the soil, the planting of seeds, the raising and harvesting of crops, and the rearing and feeding and management of live stock, and the improvement of said knowledge? Is it not advancement made therein, making progress towards what is better, working out improved results? When county agricultural societies accomplish this by raising a voluntary sum of money, and disburse it in accordance with the requirements of the said Act of 1851, they have so far complied with the Act, and would be entitled to a county bounty.

What is a voluntary contribution? Does it not consist of a sum of money contributed by the members of such society of their own volition, spontaneously, by an act of choice, not influenced or impelled by others? It must be without design or intention of a consideration, gratuitous, even not for the purpose of buying a membership in the State Board of Agriculture, by contributing the paltry sum of one dollar, so as to entitle it to a bounty of like amount. This sum would hardly be sufficient in amount to greatly promote the knowledge and improvement of agriculture, nor would it, under my construction of the Act, legitimately comply with the wording or intention of the same.

The fact of a contribution having been made by a county agricultural society in compliance with the Act, must also be attested to by the affidavit of its president and treasurer, and filed with the commissioners of that county before it can be entitled to a county bounty.

This brings the said officers to a conscientious test which, heretofore, I have reason to believe, has not been insisted upon; but now some commissioners, after consulting their attorney as to the true meaning of the Act under which this bounty is permissible, require said affidavit to be made in good faith before even admitting that the county agricultural society is entitled to a bounty, and refuse to pay it over, unless said affidavit is made in compliance with the Act, as undoubted evidence that it is entitled to said bounty. In how many counties the agricultural societies are exempt from this requirement, I cannot say. In my judgment, I do not hesitate to say, but very few, if any, under the strict reading of the Act, would be entitled to county bounty.

The intention of the Act is not for the purpose of opening up the way to build up the membership of the State Board of Agriculture. The Act creating a right to county bounty was in existence 25 years prior to the Act establishing the State Board of Agriculture; therefore, the last, in part, is conditioned upon the first. To be entitled to a county bounty, is conditioned entirely upon an amount of money raised by a voluntary contribution, for the advancement and promotion of agricultural knowledge.

The State Board of Agriculture, by its organization, and through its individual membership, is disseminating agricultural knowledge and improvement, as that required by the act of county agricultural societies. In coming down to the strict meaning of the Act, I will ask the question, what county agricultural society in the State is

doing what is required under the Act of 1851 to entitle it to the county bounty? If there is a person here in this audience to-day, I, for one, wish him to rise up and tell us in detail, just how his society is disseminating agricultural knowledge and improvement by a voluntary contribution of its members. That is the information we are anxious to have, that we may see wherein we have failed to comply with the requirement of the Act. Such information may cause the scales to drop off from the eyes of the officers of other societies, and enable them to make the required affidavit entitling them to a county bounty.

At the time the Act of 1851 was passed and approved, it was proper and right that such organizations should raise, by voluntary contributions, sums of money for agricultural knowledge and improvement, for at that time it was needed to advance agricultural interests. But since then, local agricultural societies, the State Board of Agriculture, farmers' clubs, farmers' institutes, and experimental stations have sprung into existence throughout the State, all of which are directly and indirectly doing the work, to a greater or less extent, that the Act of 1851 endeavored to provide for.

Since so much is now accomplished in that direction, through the sources above mentioned, should not the work that is now being done by the different local county agricultural societies, that hold successful annual fairs, and pay out no less than several thousand dollars, or more, annually in premiums—should this not entitle such societies to an annual county bounty, independent of a voluntary contribution? If so, why not have our legislators pass a bill substituting this in the place of that part of the Act requiring a voluntary contribution, and thereby making that requirement obsolete?

These local agricultural societies have been, and are now doing more in one year for the advancement of agriculture and horticulture, than all the moneys raised by voluntary contributions since the passage of the Act in 1851. In Lehigh county we are running one of the most successful local agricultural societies in existence in our State, and in that line are doing much for the promotion and advancement of agriculture, which is of undoubted result, and plainly to be seen by what the condition of agriculture was 40 years ago, and what it is now in our locality. To the best of my knowledge, this society does not raise an annual fund by voluntary contribution, as that required by the Act of 1851, but they have invested, in their grounds and improvements, about sixty-eight thousand dollars, and do pay out annually, six to seven thousand dollars in premiums. Should not this investment and annual disbursement of premiums, in its way, do more to advance agricultural knowledge and improvement, than the meagre sum of one hundred dollars, or less, or its double, applied as directed by the Act of 1851?

A bounty is nothing more than a premium offered to induce individuals to enlist in a cause that will give encouragement, as in this case, to husbandry.

At this time, when some States are doing so much in the way of appropriations for the purpose of extending the various interests of most importance to the welfare of the State, certainly one of so great importance as agriculture should not be over-looked, but receive its full portion of assistance, independent of voluntary contributions entitling to a county bounty.

HOW SHOULD THE APPROPRIATION FOR FARMERS' INSTITUTES BE DISTRIBUTED AMONG THE COUNTIES OF THE STATE? *

BY J. A. HERR, *Member from Clinton, Cedar Springs, Pa.*

1. The handling and distribution of public moneys is at all times a matter of serious moment, and should be guarded with all the rigor that the law provides.

2. The basis of distribution of moneys in which all are equally interested, such as public schools, charitable, eleemosynary and reformatory institutions, should be made with a view to affording everybody equal benefits of the appropriation.

3. The basis of distributions of moneys appropriated to the extending and building up of any of the industries of the State, either agricultural, mechanical, commercial or mining, must necessarily be very different, inasmuch as it must be made greater in the section of the State in which the industry is carried on to the greatest extent. "The greatest good to the greatest number" engaged in the special business which the funds are intended to foster, might be nearer the object to be aimed at.

4. The agricultural interests of the State which the appropriation for farmers' institutes is especially intended to benefit, are co-extensive with the State, yet far more prominent and important in some sections than in others.

The design of the appropriation is primarily, to educate and elevate the farmer, to make his business more valuable and remunerative and his life more agreeable and happy; and secondly, to vary and increase his productions so that he may better supply the public generally with pure, wholesome food in greater quantity and variety, and thus greatly add to the material wealth and prosperity of our great and grand old Commonwealth.

Now the question faces us, how shall we distribute this money to best meet the purpose for which it is appropriated? Farmers' institutes are comparatively new in this State, but are fast becoming in demand in all sections of the Commonwealth. To be appreciated they must be attended and studied. They will necessarily be most valuable where they will reach the greatest number of intelligent farmers.

It does not argue, however, that because this is true the institutes should be confined to those localities, to the entire neglect or disregard of the farmers who live in more sparsely settled districts.

The good to be derived from the institutes depends largely upon the active interest in them, manifested by the people among whom they are held.

Hence, it is not necessarily in the largest farming communities where institutes are most valuable, but rather in the places where the farmers are most alive to their value and interested in their work.

*At the annual meeting of 1893, the question of Farmers' Institutes was brought up for general discussion by the reference of questions to members of the Board; this essay was written in answer to the question which occupies the position of title.

Therefore the objects sought are best attained by close observance of political divisions, or by holding a specified number of institutes in each county of the State. The number of institutes held in each county should be governed by the actual good they will probably accomplish in the direct line for which the appropriation is granted. To obtain this information, the members of the Board of Agriculture, and other institute workers, together with the Secretary of the Board, must, by personal visitation and participation, study the situation and judge of the value of the good accomplished.

Where the greatest amount of good can be done, there should be a proportionate part of the fund used, under certain regulations and restrictions, among which should be the following: No section should be entirely debarred from a part of the appropriation.

A certain small part of the funds should be used to introduce farmers' institutes in new places where they are not known, but could be of value.

Persons or organizations desiring institutes should be expected to secure fair audiences of farmers to attend them, for failure of which future appropriation shall be reduced or entirely withheld, as is most desirable. The Advisory Committee of this Board, acting under the instructions of the Executive Committee and the Secretary of the Board, should make the distribution of the funds for farmers' institutes, being governed by the foregoing suggestions.

WHAT SHOULD BE THE CHARACTER OF THE EVENING EXERCISES AT FARMERS' INSTITUTES.

BY CALVIN COOPER, *Member from Lancaster, Bird-in-Hand, Pa.*

Evening entertainments at farmers' institutes have to me always been an obstacle in what I thought was the most successful institute work. First, we should consider the audience to be entertained. Second, what would be instructive in an educational line, and improve, rather than deprave, the mind. I find in this institute work an entirely different audience than those who attend the day meetings; they are composed mostly of young people, and very often of school children; hence the importance of the exercise being of such a character as will entertain, as well as instruct, the youth and children of older growth.

Now, what should be the entertainment? Each institute manager will be the best judge as to what the audience will likely be in his district, and should provide that which will be of the greatest benefit to his audience. If composed of persons of mature age, a lecture on some scientific subject, a recitation by some home talent (lady preferred), and music by the local club. But should the audience be composed of youths and school children, the exercises should be more of an illustrative character or that which can be shown upon a screen. There is no better mode of educating the mind than through the eye;

an object lesson is more indelibly impressed than any other means. A recitation or two by the best home talent that is accessible, with music, which is always necessary in evening entertainments to complete the program and preserve order. I know no better means of keeping good order in a promiscuous audience than to give them good music. But home talent should always have preference in our institute work. The practice of employing professional elocutionists at farmers' institutes, has a tendency to intimidate the more modest home talent, and while they entertain well, and personate perfectly many very ludicrous things, the impressions made upon an audience of young people, are not such as would lead us in the higher walks of life.

I am, therefore, of the opinion that we cannot be too careful in providing for evening entertainment at farmers' institutes. They should always and under all circumstances, be of an educational character, and while it is necessary to make them entertaining, we should never lose sight of a high moral influence that would elevate the mind to that which leads to good, not only in the home circle, but to the State as well.

There is another branch of education that has frequently impressed me, which might be adopted as one of the most valuable and instructive entertainments, where the audience is composed of young ladies and gentlemen of mature age, and older people as well. I allude to a lecture on political economy; not such as would develop into partisan politics, for I well know the antipathy that prevails in this Board from allowing any subject of that kind to be discussed at its meetings, but such thought and teachings that would develop into the wisdom of good State and national government; such as would lead the mind of man (and woman, too,) to study the needs of our State and nation and bring about the formulation of laws for the good and equitable government of the whole people; such teachings as would induce our lawmakers to rise above party as well as individual selfishness, and legislate for the good of all; such as would teach the good citizens of our Commonwealth the lesson of self-government, and when necessary, rebuke the party that dared to nominate an incompetent person for the highest office in the gift of the State, and elect from the minority party one whose official ability had stood the test of competency, and whose character had won the love and admiration of the people of his State.

THE RESPONSIBILITY OF THE FARMER CLASS IN SHAPING THE DESTINIES OF THE NATION.

BY DR. JOHN P. EDGE, *Member from Chester, Downingtown, Pa.*

We are not permitted, and very properly, to engage in partisan discussions at these meetings of the State Board. But there are many subjects, outside of party, that run so near to the party lines as to disturb the nerves of the party man, who is ever alert and ready to throw

off his coat and fight for his party. The title of my paper may suggest this danger, but I will try to steer clear of the danger line.

The farming class have for some years been gradually finding out what they should have known and acted upon long ago, that the success or failure of their business interests and operations for profit, very largely depends on the character of the laws under which they live; supplemented, of course, by the results of skill and industry; and that, if they are to have those influences favorable to success, the farmer must give his attention to legislation, as well as to the weather and the crop conditions. He must not put too much of his faith or hope in the keeping of the professional politician or the regulation statesman, who, nine times out of ten, or every time, will work in the interest of the party that pays him best, and will so construct or construe the law as to serve their best purposes.

It has been in this way that corporate power has been able to control the framing of the law to a large extent in recent years. And it has only been since these boards of agriculture, farmers' institutes, and kindred organizations have been established, that this large class of our people are asserting themselves, and, through organization and concert of action, influencing the framing of laws so as to promote the farming interests in a healthy, business way. I say, large class! The last, as have previous census tables shown, that, of the many millions of our people, nearly or fully one-half are engaged in, or directly dependent on, the cultivation of the soil.

Confining myself to general statements, I find, as a matter of fact, that with each decade the proportion of the farmer class has been steadily diminishing, as compared with the whole number. This, in one sense, is right, as it increases the relative number of consumers, and in so far, is a gain to the producer.

Again, the census tables show that the wealth of the nation is steadily narrowing into relatively fewer hands, until now, less than three millions own or control seven-tenths of the wealth of the country, while the remaining three-tenths is distributed among the other sixty millions, ranging from the millionaire to the pauper line. This concentration of capital in control of the few, enables them, by forming combines in various ways, to regulate production and prices, and puts them to a large extent in control of the markets—the sources of supply from which we all have to depend in supplying our wants.

Another very natural result of these conditions is in the legislation of the State and nation being under the control of these money princes. Look at our United States Senate today, made up as it is, of a large majority of millionaires, who are more distinguished for their brass and the contents of their abdomens than for what is in their craniums. It is an open secret that many of these men have bought their seats in the open market. The lower house is not much better. A man of moderate means has a very poor show, these times, in the chances for nomination or election to positions of honor or trust, within party lines. Boodie rules the hour.

Who is responsible for this condition? The voter, you will say! Who are the voters? Largely made up, as I have already suggested, of farmers, with their natural allies, the tradesmen, who, with the political power of the nation within their control, tamely allow the law-making turned over to men who are neither farmers nor in sympathy with them. Thus, we see that of the more than four hundred

members of our Congress, not one score of them are supposed to be practical farmers.

What influences control legislation in Pennsylvania? Without question it is the large cities and other monied corporations, which, through the power of concentrated capital, through organization and the manipulation of well paid lobbyists, have at will, not only secured such enactments as they wished, but at the same time have crowded out the measures designed for the benefit of the rural districts.

Again I ask, who is responsible? We have, my friends, been gradually drifting towards that condition so forcibly described by Dr. Goldsmith in "The Deserted Village," and although so often quoted, I will repeat here:

"Hard fares the land, to wasting ills a prey—
Where wealth accumulates and men decay.
Princes and lords may flourish or may fade,—
A breath can make them, as a breath has made;
But a bold peasantry, its country's pride,
When once destroyed, can never be supplied.

Now, it is an historical fact, that whenever capital has secured a complete control over production, so as to reduce the producer to the condition of vassalage, that patriotism has waned or died, or been asserted only through revolution, either civil or sanguinary.

"Freedom's soil hath only place,
For a free and fearless race."

So sang Whittier.

The general substitution of machinery for manual labor and the joining of capital in large industries, have so greatly increased the outcome of production as to materially counteract the hardening results of monopoly, and so swelled the volume of currency for the use of the masses, that in a well organized society, where the rights of all are recognized and respected, it is quite possible for the industrial classes to secure and enjoy the comforts and rest from toil so desirable for us all. Personally, I do not believe in constant toil and no play.

The progress that has been made in the last fifty years in the environments of our social life in this country, has been wonderful. This has been made more certain from the fact that the great majority of our people are educated, and have their interests in the line of a desire for growth and change. And it is a truism that "the general acceptance of political justice directly stimulates the desire for economic justice and enlargement." So that when political bossism can be broken up or down, the despotism of capital must go down with it.

Then true statesmanship can have its proper place in our civil system, developing the new environment, and retaining that which is valuable in the old systems. But, to secure this end, there must be united action in society to secure even justice, enlarged opportunity for good men in public life and improved chances in the life work in a general sense.

Need I affirm that in this work the farmer must be on top. He has

the destiny of the nation in his keeping and must use it. He must become a politician! He must be more than that, a patriot, as the fathers were patriots. He must be in the lead as the party of largest interest, and must see to it that the law-making business shall be assigned to men who are free from the trammels of the money power, and fully in sympathy with the masses in their life work. There are evidences all around of the coming revolution, and it is not surprising that in the new born zeal some extravagant and unwise things are said and done. But, out of this stir in the elements of discontent, I look for an early concentration of action that will secure substantial ends. It will take all the wisdom of the wise to guide those elements to a happy resolve.

The national party that has recently assumed the reins of power did not secure its half million of majority because its declarations were in accord with the masses, but rather through the element of discontent at existing conditions. And the party that for more than a generation had held the reins of government and been repeatedly honored by large majorities on the popular vote, now finds itself rejected by over one million ballots on that popular vote, because its declarations and its methods were no longer acceptable to the masses. It is a logical conclusion with me, that the successful one, much less the defeated, cannot retain or regain a popular approval unless they bring their platforms and their practice into accord with the best interests and demands of this discontented majority, largely made up of farmers. This, then, is the farmer's opportunity. And let us, therefore, give a few minutes' attention to some of the underlying principles that shall inure to the true progress and preservation of a "government of the people, for the people and by the people."

First of all must be checked the tendency of recent years to make this a paternal government, in which the favored few have been made to prosper at the expense of the many. We must restore, instead, the old idea of the fathers, that this is a constitutional government, coming from the people.

As a part of this result we must do away with industrial monopoly, and establish industrial freedom. In brief, instead of the government taking care of the people who constitute it, the people must take the control of the government.

Party lines and party fences must give way to the advancing tide, and new lines and safer guards replace them. As a logical outcome, unequal systems of taxation will be corrected, and the consumer no longer be subject to injustice at the hands of organized capital.

Now, I do not want any of you to be alarmed at these utterances. I am as far from the endorsement of agrarian or socialistic methods as you see I am from boss methods. But I do assert that the present conditions can only be corrected by the combined intelligence and patriotism of the producing classes, who are the farmers and those in a business sympathy with them, guided by the wisest councils of the best men.

The education of the children must be directed away from the mistaken idea that in a standing military force the strength of the State resides, and be taught, rather, that in virtue and industry reside the strong arm of the State; and that war cannot exist only through the baser passions of men, guided by official dishonesty or treachery. We have just now a potent illustration that in arbitration we have all the

requirements for adjusting differences with other nations, as they may arise. It is in the submission of the Behring Sea controversy to an impartial arbitrator, before whom the whole question at issue was fought out by the best legal talent of both nations, to a friendly and happy issue.

There are many legalized evils from which we suffer and to which we pay tribute; none so potent for evil to the State or the individual as that known as the license system of Pennsylvania. Its results are so glaring and destructive that I cannot pass it over silently in a paper of this kind. A law by which a very few of our citizens are granted privileges from which all others are excluded under severe penalties of the criminal laws, is in itself altogether out of accord with the spirit and purposes of our compact, which specifically denies the right of the General Assembly to create a privileged class. But, through the granting of the exclusive right to sell intoxicants, there exists to-day an aristocracy that controls, not only the choice of our lawmakers, but executive officers—our presidents and down to the judges of the courts, while the masses of the people have suffered immeasurably in character, health, morals, property, and political prestige.

Looking at the business from an economical standpoint alone, it is a black spot on the surface of society. And while, perhaps, the evils of the drink usage are as glaring as they ever have been, it is a cheering fact that our civilization has become so alive to these evils as to force them into prominence. It is mainly due to the strong influence of inherited ideas and tastes, that greater progress has not been made in correcting the evils belonging to the license system. Prejudice and depraved appetite have had the control. But a new generation, educated in the knowledge of the economic and pathological effects of the drink usage, is taking the place of the old prejudices, and slowly but steadily the sentiment is growing that the saloon must go.

The debasement of a large percentage of the grain we raise to the manufacture of spirits in its many forms, the robbing of our soils for the growing of tobacco, the ally and companion of the intoxicant, are large factors in the thought on this question, and should have great weight with the economist in its discussion.

When it is shown that two abstainers can be supported on the land required to satisfy the coarse taste of the dram drinker and tobacco fiend, we have an unanswerable argument in behalf of abstinence, its safety and economy.

Steadily as I believe is this sentiment growing, and as steadily are the habits and social and domestic conditions of society working to better ends.

Our domestic habits and occupations are so different from the harder and more exposed life, and coarser fare of our forefathers, that we no longer require the use of stimulants during health, and when used, their destructive effect is greatly increased, both from their general bad quality and the more feeble resistance of our less rugged constitutions.

This great question, therefore, must be met on its economic, rather than on its moral basis; and the moral suasion ideas must give place in the struggle while the law shall be invoked, through the freeman's ballot, to settle it.

And don't you forget it, that in making up the issue, that more than one-half of the adults in Pennsylvania have no voice in this form

of settlement, though on the average more intelligent and with better nerve and conscience than the average voter. This element is coming to the front, and with it in the estimate, I say the time is near "when, under a better knowledge of the economic gains from abstinence, its influence will be such that it will become unwise in the drinker to frequent the saloon, while the strength of political power will remove the saloon from the pathway of the drinker."

But it will be only through devotion to their true interests, and the exercise of a sturdy patriotism, that the farmer class shall call back to their control the destiny of this nation, which, to all present appearances, they have had too little influence in shaping.

There is every reason, my friends, to look with hopeful vision on the future. Intelligence and active discussion are displacing the indifference of the past, so that really, as the poet Holmes has poetically said, the farmer is marching to the front.

"Clear the brown path, to meet his coulters gleam!
Lo! On he comes, behind his smoking team;
With toil's bright dew-drops on his sun-burnt brow;
The Lord of Earth, the hero of the plow."

Assert, therefore, and keep the place which properly belongs to you, in view of your over-showing members and the importance of your business.

Lord Byron had the true sentiment of patriotism and devotion to country when he wrote of the patriot martyrs:

"They never fail who die
In a great cause; the block may soak their gore,
Their heads may sodden in the sun, their limbs
Be strung to city gates and castle walls—
But still their spirits walk abroad. Though years
Elapse, and others share as dark a doom,
They but augment the deed and sweeping thought
Which overpower all others, and conduct
The world at last to freedom! What were we
If Brutus had not lived? He died in giving
Rome liberty, but left a deathless lesson—
A name which is a virtue, and a soul
Which multiplies itself throughout all time,
When wicked men wax mighty, and a State grows servile."

SHOULD THE SCIENCE OF AGRICULTURE BE TAUGHT IN OUR PUBLIC SCHOOLS?

BY MAJ. B. F. HERRINGTON, *Member from Greene, Waynesburg, Pa.*

Honor is due the great founder of Pennsylvania for his expressed desire to make provision for the education of the poor, gratis, which he had inserted in the original draft of the organic law.

This was our common school system in embryo; the Alpha, but the Omega is not yet. Before the dawn of the State's life, when what is now the great Commonwealth of Pennsylvania was carried in the vest pocket of its founder. For many years little attention had been given to the liberal views of Pennsylvania for free education. As a consequence, it will be found by reference to the books in the registers' offices throughout the several counties of the Commonwealth, that a large proportion of the people affixed their signatures to conveyances by a mark.

The little spark of intellectual fire thus kindled, lay, for a time, almost dormant, but the smouldering embers were fanned into a blaze by the eloquent appeal of Stevens, Brock, Smith and Burrows; and to-day its light shines from every hill-top and valley in the Commonwealth, and the common school system, free alike to rich and poor, to the millionaire and the pauper, was firmly established, beginning with reading, writing and arithmetic; other branches have been added, larger appropriations have been made, and today we have one of the greatest school systems in the world; but it fails, in a measure, to meet the requirements of the people.

The gilt-edged millionaire farmers, who live in marble palaces, with rosewood stables, and mahogany hog pens, and recline at ease on their silken sofas, care naught for the benefit that may be derived from the common schools. Their children are taught in private schools or in higher institutions of learning, which ever they may elect.

Not so with the great mass of intelligent, hard working farmers, whose homes are scattered all over the hills and valleys of the Commonwealth. They are not so circumstanced that they can send their children away to distant colleges to learn the higher branches. No; if ever the children of the rural district are to learn the sciences that pertain to their life work, it must be taught them in the common schools.

Some of the brightest children of this or any other land are found in the farm houses all over our State; but they must remain ignorant of the advantages arising from a knowledge of agricultural science if the public schools come not to the rescue.

Yesterday the wooden mold-board, the spike-tooth harrow, the sickle, the scythe and the flail constituted an agricultural outfit. With these imperfect implements and a great amount of manual labor, the work of the farm was accomplished. The science of agriculture was unknown. Today these primitive implements have been superseded by the Oliver chilled, the spring-tooth, the disk, the cutaway harrow, the reapers, mowers and threshers.

But what of tomorrow? Thanks be to the Creator of the universe, He who holds the thunder in His hand and scatters the lightning with His fingers, has made it possible, through the genius of a Franklin, to bridle the fiery element of electricity in its cloud home in the heavens and lead it down to earth with a hempen cord, to do the bidding of man. And, through the wisdom of a Morse, He has taught it the language of our people; and, through the instrumentalities of an Edison and a Bell, its voice is heard through the land.

But this is not all; ere the dawn of another century, electricity will have taken the place of other powers. The electric wagon will roll over our farms and along our public roads; the electric plow, harrow and reaper and mower and thresher will do the work of the farm. In

other countries the lower class, or order, might be confined to the rudiments of knowledge, but in this country, and especially in Pennsylvania, we have no lower class. The professional man and the capitalist, the poet and the philosopher, the mechanic and the merchant, all spring alike from the masses, and principally from the agricultural portions of the community.

If your child is destined to be a minister of the gospel, he is fitted for his calling in a theological seminary. If he is to be a merchant, he attends a commercial college and qualifies himself for the duties pertaining to that business. If he is to follow the profession of a lawyer, the law schools are open to him. If he is to be a follower of Esculapius, he enters a medical college and acquires a knowledge of that profession. But if he is to be a farmer, where will he obtain a knowledge of the advanced ideas of agricultural science? It is true, the State College, with its able corps of learned professors, are doing a noble work in that direction, but they cannot accommodate all. Their arms are too short. And if they could, there are thousands of worthy children throughout the State who could not leave their homes. They are necessarily compelled to remain at home and assist their parents in tilling the soil, and consequently they are left to wear their lives away, ignorant of the fact that there is such a thing as farming on scientific principles. Through the wisdom of our legislators, an appropriation was made at their last session of \$5,500,000 for school purposes this year. And, I am proud to say, it met the hearty approval of our honored chief executive of the Commonwealth. If we add to this the amount collected by taxation, we have an aggregate of \$17,000,000. I firmly believe that with this amount the branches I have referred to, could be taught without the expenditure of another dollar.

THE NECESSITY OF CHANGING OUR SYSTEM OF FARMING.

BY HON. GEO. D. STITZEL, *Member from Berks, Reading, Pa.*

A statement made by a prominent Berks county farmer, at a recent meeting of the Reading Board of Trade, prompted me to give a few thoughts showing why the agriculturists of Pennsylvania should change their system of farming. The board of trade of the city of Reading, unlike the commercial organizations of most cities, admits to membership farmers and non-residents, upon the sensible platform that whoever is interested in the growth and progress of the city is entitled to participation in the furtherance of the objects of the organization. Our large cities furnish excellent markets for the farmers, and, consequently, whatever tends to the advancement and prosperity of those cities is to their advantage. In its large membership of nearly six hundred, there are a number of farmers and owners of farms, and at the monthly meetings there are discussions of topics of special interest to the farmer.

The farmer referred to had occasion to speak of the low price of wheat, and said that, at 75 cents per bushel, the production of wheat in the Eastern States is a losing business. He showed that at the average yield in Pennsylvania, and taking into consideration the value of the seed and the cost of preparing the soil, the expense of harvesting and preparing the crop for market, and the interest on the land, the cost of production to the farmer is more than 75 cents per bushel. He argued that under such circumstances it is no longer profitable to grow wheat, and that the system of rotation of crops, as followed in Pennsylvania for upwards of a century, is a failure. This farmer is a leader in the Alliance movement, and is a prominent granger; hence his remarks created quite a sensation in the county.

With the superior advantages possessed by the West, the cheapness of lands, the opportunity of using steam plows, and transportation rates favoring that section of the Union, as against the East, it has long been obvious to me that the farmer of Pennsylvania must change his mode of operations if he hopes to make money. The low price of grain is a serious matter for the farmer to consider. Seventy-five cents per bushel is less than the cost of cultivation, and, with high taxes, the tendency of which is to increase, rather than diminish, a farmer carrying a mortgage upon his land will be unable to make up the interest, and bankruptcy stares him in the face. In my county of Berks, the taxes on farm lands have increased wonderfully—500 per cent. in 48 years. On a certain farm, well known to me during that period, the county tax used to be \$10 and \$11 per annum; now it is \$50 and \$60. The school taxes, as well as road taxes, have also increased correspondingly, notwithstanding the large appropriation from the State to support the schools. The same observation holds good in regard to other farms in the same section of the county, as the owners have informed me.

The scarcity of labor is another serious drawback to the farmer. Labor-saving inventions have resulted in farm laborers seeking employment around the iron works and in other industrial channels, so that to secure the few men necessary to conduct the operations of the farm, great difficulty is experienced. Wages have increased, and this has added to the cost of producing a bushel of grain. Less than a week ago wheat sold on the Chicago Board of Trade for 63 cents per bushel, the lowest price ever recorded in that market.

The disadvantages to which I have alluded, have caused farmers to turn in other directions to make both ends meet—some to dairying, others to feeding cattle, others to fruit growing, and still others to diversified farming. The farmers who will join a board of trade for the purpose of maintaining the prosperity of a city, encouraging new industries, and fostering those already in existence, will naturally grow a variety of crops, raising such things as can readily be sold in the city markets at a good profit.

The dairy is one of the most important adjuncts of a farm, and indeed, in eastern Pennsylvania, where every farmer has the advantage of good markets, no branch of farming is more profitable. This idea was prominently brought out at the discussions of the Berks County Agricultural Society, a series of dairy topics having been considered at the monthly meetings of the society held during the winter and

spring. Enterprising farmers have attended these meetings and produced figures showing their average profits, and making it very evident that on farms of moderate size, it is not only possible, by proper attention to dairying, to make a good living, but to lay by a nice sum of money annually. Fifty dollars for each cow per annum is not an uncommon income, and there are some farmers in Berks county who have reported as high as \$60 per cow. Right here, I desire to give the experience of a progressive Berks county farmer.

John D. Smith, of Monocacy, makes money by farming systematically a small tract of land. Mr. Smith's farm consists of 67 acres. He works very little outside of this farm and yet supports his family well and lays aside a comfortable sum of money every year. Mr. Smith, however, does not only work during the summer, but is busy every working day in the year, the same as people in other walks of life must be if they want to succeed. He is a member of the Pennsylvania Milk Association. This association was organized for the purpose of establishing better market facilities for the farmers. Previous to the existence of this organization, the farmers who wanted to commence shipping milk were compelled to first hunt about in some city for a customer who would regularly take their product. This, in most cases, was very tedious work. Sometimes it was impossible for a farmer to get one man to take all his milk. In such cases he was compelled to ship to different parties every day. Many small farmers, rather than hunt about so long for a milk customer, gave up altogether the idea of shipping. Even those who were so fortunate as to have a regular customer for their milk, were sometimes on the point of quitting to send their milk on account of difficulty in collecting the money for the milk shipped. In some cases it was necessary to make several trips to the place to which the milk was shipped, in order to get the money for the product of a month. Every now and then a bill was lost entirely. The milk customers very seldom continued longer than a few months at a time. Many of them made a change if some other party offered them milk at one-fourth of a cent less a quart than what they were paying, even if the cheaper milk was poorer in quality than the other. The farmer wasn't generally given any notice in advance, but was surprised by letter somewhat like the following: "Don't send me any more of your milk after today." Such notices often found the farmer busy at haying, harvesting, or some other important or pressing work. There was but one thing for him to do, and that was to start off immediately in quest of a milk customer, as he wasn't prepared to commence butter making. To overcome these difficulties, the milk shippers of Berks, Chester, Montgomery and Lancaster counties organized the milk association. It was started about five years ago.

Mr. Smith says that, so far as he has been able to learn, the members are well satisfied with the workings of the association. An agent is employed, who sells the milk. In the course of an interview concerning the association, and his own experience, he said: "The association gets freight rates much cheaper than individuals. We pay only one-half of a cent a quart at present for shipping milk. Each shipper pays his own freight. The salesman makes as much money out of the milk as he can, and the members receive commensurate checks each month. The price averages about \$3.90 per hundred quarts. I couldn't make as much out of my milk in any other way.

Some of the big milk raisers may be able to do a little better financially by marketing their own milk, but small shippers should certainly join an association. Nearly all of the farmers living along the railroads between Philadelphia and Reading are members of the association.

"The production of milk pays me much better than any other branch of farming. I keep 13 cows, which average about 70 quarts of milk a day. During the winter I feed them mostly on corn chop, bran and corn fodder. My cows bring me over \$50 a month clear money. I think that pays well enough. During the summer I don't feed them much besides grass. Milk raising is my specialty. Every farmer should have one special line to pursue, and work to that purpose at all times. I don't believe it pays anybody to run a farm by proxy—hiring men to do the work without his presence."

Other farmers in Berks county have had the same experience. James McGowan, president of the Berks County Agricultural Society, who operates three farms, has turned his attention latterly to dairying almost exclusively, and finds it the easiest and most profitable system of farming. He sends his milk to creameries near his farms. He also gives considerable attention to fruit growing, having large and productive farms. E. M. Zerr, vice president of the same society, who attended the Reading markets for many years, now gives his attention to dairying. His green-houses and truck farm he has rented out on the shares.

With a protective tariff on wool, there is an inducement for farmers to raise sheep, which is a very profitable industry. In some of the hilly sections of the State, it may be said to be the only farm industry which will succeed well. Sheep, to be profitable, must have good care. Good care means more than simply good feed; it means close watching. The diseases of sheep are seriously on the increase. Parasitic diseases are the worst. It is a poor time to doctor a sheep when it is nearly gone. Four things are absolutely necessary for success—man, quarters, breed and feed. Most depends upon the man. He should be as meek as Moses, as patient as Job, as gentle as a woman, and with a heart full of loving kindness. The quarters must be light, dry and airy. It would be as satisfactory to try to raise early potatoes as early lambs in a snow bank. The Dorset Horn is one of the best of all breeds; but crossing Merino ewes with Dorset rams is an improvement. Next to Dorsets, the Hampshires, Shropshires and South Downs.

Farmers should devote more attention to raising hogs. A short time ago pork sold at \$11 per 100 pounds. With the prices of grain as low as at present, there certainly is a good profit in raising pork at a few dollars per hundred less than the present price. I think all farmers should at least convert their surplus corn into pork. Raising pigs and selling them when young, pays at present. During the season just past, plenty of pigs were sold at from \$10 to \$12 each. It is true that the price will not always remain as high as now, but there is profit in it at a much lower figure. The farmer who continues all the time is the one who will catch the high prices, which, as every experienced man knows, are bound to come every few years in the hog business.

Poultry raising is another profitable industry. On a tract of 10 acres of land, with a good stock of poultry, an excellent living can be

made in eggs and raising broilers for market. The latter, since the introduction of incubators, has become very general. Raising spring chickens at 40 cents per pound is a paying business, but, like everything else, experience is required to make it successful.

The importance of fruit growing should not be overlooked. This matter has already received attention at the farmers' institutes. The chairman of the General Fruit Committee of the State Horticultural Association, Mr. Cyrus T. Fox, of Reading, has compiled statistics during the past few years, gleaned from reports received from hundreds of correspondents throughout the State, showing the great profits of fruit culture. The establishing of canneries and fruit preserving houses in the agricultural districts, will do much towards stimulating the raising of fruits and vegetables.

Of late years, the planting of nut bearing trees has proven quite profitable. There is a splendid opportunity for the farmer in this direction. A Berks county farmer has planted some 40 acres with nut bearing trees, chestnuts, shell-barks and English walnuts. This person has, very wisely, given three-fourths of his acreage to chestnuts. They are of the Paragon variety, and will come into bearing, some in the second and all in the third year, and their production will yield him a handsome revenue. Shellbarks are of slow growth, but must ultimately become profitable, also. And these trees have been planted on ground that is of little value for ordinary tillage. The English walnut sometimes yields to our inclement winters and will be found less reliable than other kinds, but to plant them may prove profitable, nevertheless.

There is a plot of some 20 acres which was planted by Dr. D. Heber Plank, on his farm near Morgantown, over 10 years ago, with French walnut trees, and there are now in fine growing condition nearly 200 trees. Some of these trees are now from 12 to 15 feet high and bearing some fruit. These walnuts were imported by the Doctor for the express purpose of raising walnut trees, which are fast becoming exterminated throughout this country, and the venture will no doubt prove a valuable one. In addition to these French walnuts, Dr. Plank has also about 20 acres of black walnut trees growing, all of which are very fine. The majority of these walnuts were planted in the spring of 1883. It is well worth while for one to visit this unique walnut farm of the Doctor's, who, by the way, always has a warm welcome for parties interested in such enterprises.

TAXATION.

BY HON. R. E. PATTISON, *Governor, and President of the Board.*

(An address at the Kittanning Meeting.)

The question of taxation is a very old one and very much discussed, and possibly ought to be classified among those subjects which have been placed under the denomination of an irrepressible conflict between men. There is an old saying that the mills of God grind slowly, but they grind exceeding small, and that is true of everything which criticises nature in its specific sense. The world moves very slowly. The progress of men has been through a series of six

thousand years. Society has come to its present condition by long progress. So all these questions which we have been discussing, I have no doubt, will be solved satisfactorily to the general public. We are so anxious and ambitious to solve them, in our day, that every theologian, of every denomination, thinks there shall come some reformation in his day that shall be for the betterment of the world. Others take their places, and wage the contest, and, in the course time, these questions will be worked out as are all other questions.

The question of taxation, the question that is so much discussed now, the unequal distribution of property, that is not new. Under the Mosaic law, property became so unequally distributed that there was established a year of jubilee. Every fifty years it was discovered that some people would collect more than others, and the result was that there was a law made for the re-distribution of property; but it was always found that the industrious man had the money. In the question of taxation men justly differ, reasonably differ. I never thought there ought to be any particular heat in the discussion of that question. It is a question of finance, and men may differ wisely in the methods of raising money. It concerns the calculating side of man and it is something that he did not bring with him into the world, and is something that he will not carry out and it ought to be discussed with intelligence.

I will refer to the taxation question in our State simply for a few moments. I have my thoughts upon this subject; I am not prepared to say to you that those thoughts are in the right direction, yet I am happy to hear any discussion or any suggestion as to any error that may be in the thought that I express to you. The question of taxation in our State has received a great deal of attention. The State revenue laws are as conflicting as laws can well be constructed. I doubt whether outside of the Dauphin county bar, there is any member of the bar who will attempt to construe the laws of the revenue system of our Commonwealth. Indeed, some of them make a business of nothing else; they do not pretend to go into any other business. There is not a merchant or banking house, or a man, when the State tax is imposed, absolutely capable of determining what he is to pay under that law. It grows out of our method and system of collecting our revenue. If there is any law upon the statute books that ought to be clear, it is the law of revenue. It concerns man's pocket. It touches his business and he ought to be able to know just what the State wants him to pay. He ought to be able to determine just what he is compelled to pay without consulting an attorney. Such a result will never be accomplished under our present revenue system of the Commonwealth. I would suggest to you, and it is worthy of your discussion, I think it must ultimately come, and that is the relieving of our statute books entirely of all revenue laws. Then how is the State to be supported? Now let us see: The city of Philadelphia raises just twice as much as Pennsylvania, more than twice as much—twenty-two millions. The city of Pittsburgh will raise one-half as much as the State of Pennsylvania; it has no revenue law. The town of Kittanning will raise money to support its borough affairs, but it has no revenue laws to raise this money. Then why embarrass the statute books to make the revenue laws so undetermined that the citizen does not know what he has to pay. As controller of Philadelphia, I had supervision for five years, and it was built up from finan-

cial officer to officer. The State of Pennsylvania, without its revenue system, can raise its ten millions annually by simply directing the Auditor General to make up his budget on the first Tuesday of January of every session of the Legislature, and basing his calculation of paid in capital of the corporations of the Commonwealth, estimated at the value at which their stocks are selling or their dividend earning capacity. Having done that and placed that down on his list as the subject upon which he has based the income, and taking the collateral inheritance, which it was thought wisest to continue, and the income from the miscellaneous fees which the State receives, and simply taking a millage on that total, ascertain what shall be the revenue of the State. The Auditor General having the return upon his books—I state these details clearly so you may understand the system instead of talking to you as to principles of taxation, but by the Auditor General taking in the paid in capital, and with that figuring a millage, and then after that the collateral inheritance tax, and then to that the income from fees, the income of the State of Pennsylvania will be derived by that simple process, a mere matter of multiplication. So that when the bills go out from the Auditor General to the several corporations who are to pay, they simply make the calculation on the basis of their paid in capital of that corporation and the millage, and there is an exchange of bills and receipts. Having done that, the Auditor General, on the second Tuesday, certifies to the Legislature that if they want to fix a six mill tax in order to get a certain income, then his budget shows the figures. If they want five mills, it will show that. If they want to increase the expenditure, they can make it seven mills or eight mills. So, from year to year, the Legislature may be compelled to fix that on the second Tuesday of January, and in adopting a plan like this there could be no excess or shortage at the end of the fiscal year. Such a system as that will do away with the whole question of the present taxation with reference to our system of revenue. Perhaps I can make it clearer by taking the city of Philadelphia: The city of Philadelphia, during the month of September, through its council assemblies, the real estate is put down at a certain amount, the finance committee considers the question whether they shall continue the \$1.85 or \$2.00 rate. If the city council decides that the city wants to spend two millions, they can increase. If they want to decrease, they simply reduce the rate. Under an ordinance of Philadelphia the tax rate must be fixed before the first of October. Having fixed the rate, all the expenditures are fixed with the tax rate and all appropriations must be made before the first of January. Such a system is a flexible system. Under our system, if the revenues are too small and not sufficient to pay the expenditures of the Commonwealth, a new law must be passed. We have raised twenty-two millions a year under that system. You would never hear of the question of revenue in the State of Pennsylvania if you had such a system as that. This is a very simple process and very simple method and would relieve us, in my judgment, of much of the discussion that is going on with reference to our system of revenues. The subjects paying the revenues to the State would be interested in an economical administration of the affairs of the State, because no interest supporting the Commonwealth would want an increase, and instead of being at Harrisburg promoting an extravagant Legislature, they would be there advocating economical legislation. Having done

that, all other subjects of taxation could go to the several counties. Personal property, money at interest and all other sources of income could go to the counties. The county having all other subjects, the county commissioner can proceed to equalize the subject of personal property and real estate. In the poorer counties, that we somewhat financially embarrass, this system would help them out wonderfully well. I believe you are discussing this question at a long range. If you discuss the question of equalization of taxation from a county standpoint, you are discussing it at home where you can easily control it.

Such are some of the thoughts that the subject of taxation brings up. I don't know whether it will come in my day. I believe it is simply a plain way of disposing of the question of revenue in our Commonwealth. But you know we are wedded to our thoughts, and men do not readily let them go. It may take time. I give these thoughts for you to think over.

There is another thought in connection with it that enters into all subjects of taxation: You cannot have large expenditures and a low tax rate. If you mean to expend public money in great improvements, you must pay taxes to make those improvements. Large expenditures and low tax rates won't go together. You can't relieve yourselves of the burden of taxation by shifting them over on your neighbor. After all, this theory of taxation, as I have said, is so often discussed, and the principles so largely settled, that I must quote from Adam Smith, in his "Wealth of Nations;" he said it reminded him of a stone that was started at the head of the stairs and rolled down itself, down to rest on the last step. The first point will be to relieve us of that tax and put it on somebody else, and so the struggle goes on in trying to be relieved of that taxation. The only way to reduce taxation is to reduce expenditure. There has been an attempt to raise the revenues of our State; they have been raised in our Commonwealth to about thirteen millions of dollars. Now, five and a half millions goes to schools and three millions to charitable institutions, some of them public and some of them semi-public. I suppose the direct expenses of this Commonwealth will not exceed two and a half millions of dollars; the other sums are made up in the large appropriations which I have mentioned to you. Now, if you are to increase the expenditure of the State, that must mean increased taxation. Don't think for one moment that because you put these expenditures on the corporations you escape them, for that is not true. The very moment you put it on them, the officers will find out where they can put it on the other fellow. If it is a railroad corporation, the fraction of a cent in the fare, the withdrawal of the excursion tickets, the increase of a fraction of a cent in the freight, will make up the increase of taxation. If it is a trust company, the board of directors are very anxious to maintain the dividend of last year, and so they meet and they determine that in order to make up for the increased taxation that they must keep up the rates of interest, and the man who deals with the trust company is bound to pay the increased rate of discount. From whatever standpoint you look at taxation, it is not so much a question of equalization as it is of men to escape taxation. There is only one consolation on the question as to a low tax rate, and that is, economical government and reduced expenditures.

My conclusion is, that the fairest method of taxation is upon the

amount of paid in capital. The method of calculation, which possibly is a reasonable one, that you should grade the capital by its earning capacity, is an uncertain one. The uncertainty is that it may have one earning capacity this year and another earning capacity next because it is not fixed and determined.

The subject of taxation began with the organization of society thousands of years ago, when the first man was taxed, and when the first man tried to put it on the other, and so it has continued and will continue likely until the millenium comes, at which time we may be willing to bear each others burdens.

The subjects of taxation should always be easily found. Personal property is always an uncertain element because it is easily concealed. I doubt very much whether you will be able to find all the personal property with the same facility that you will real estate, but wherever it can be found, it ought to be treated precisely the same as real estate. Some years ago I wrote to most of the county commissioners to try to ascertain all forms of personal property as valued by the home authorities, and, taking the returns as we did in the State and income, I found personal property was in excess of real estate, putting it on a mere financial basis. It is difficult to deny the right of the man who invested his capital in real estate to further the demand of the men who has personal property, that they shall both pay alike. There are reasons why, of course, and as I started out in the beginning to say to you, that this question ought to be deliberately discussed from all standpoints. There are times when industries ought to be encouraged in a growing country; that is to say, nursed a little. I think citizens, generally, conceded that, but when you consider that the real estate of the country has been bearing the burden and heat of the day for the last twenty-five or thirty years, it is about time this nursing would stop for awhile. As far as I can ascertain, we were inclined to put the valuation on real estate so as to encourage manufacture and the introduction of manufactories through our country. That was the beginning of it, and I think you all will concede the importance of having the manufactories brought into the different communities of the State. Now, I think it is about time to begin to look after the other side.

FORESTRY NOTES.

BY THE SECRETARY.

In his annual message of 1873, Governor Hartranft thus calls the attention of the Legislature to the importance of some State action in relation to the preservation or replacement of our forests:

"I especially invite your attention to an evil of considerable magnitude, which has every year grown more aggravated, and, in certain regions, at times, is the cause of serious apprehension and loss. I refer to the wholesale destruction of our forests, the stripping of our mountains and hills of their trees, resulting in enormous diminution of water for mechanical and fertilizing purposes, and in great changes in the normal conditions of temperature and moisture, affecting the

general health, and at seasons bringing about devastating floods. These consequences, as the effects of this indiscriminate waste, are deplorable, and a wise Legislature will forecast the future and establish such regulations as will rescue our descendants from the ills a perseverance in this practice will certainly entail upon them."

In an examination into the results of the general removal of forest growth upon climate, rainfall, and local conditions, we naturally expect to find more or less data in the records of the older countries of Europe, and by these records we find that many years ago the attention of the various governments was called to the same conditions as are alluded to by Governor Hartranft, and that, from time to time, legislation was obtained looking towards the preservation of the remaining forests and the reforestation in sections where the original forest had been removed.

In establishing the change in conditions which are said to follow the removal of forest growth, we need not necessarily examine the records of Europe to obtain data to show that these changes have taken place there, for there are hundreds among our own farmers who can cite cases in which springs have entirely failed; in which what were formerly valuable water powers, have become practically valueless on account of the uncertain supply of water; where streams do not extend as far up the ravines as formerly, and where floods are more frequent and create greater loss of property. These cases are all around us and few are bold enough to claim that the effects are not produced, and that they are not due to the removal of the timber.

European records and writings furnish numerous instances to prove the occurrence of these results: Marschand writes thus: "Before the felling of the woods, within the last few years, in the valley of the Soule, the Comb-es-Monnin, and the Little Valley, the Lorne furnished a regular supply of water for the iron works of Unterwyse, which was almost unaffected by drought or heavy rains. The Lorne has now become a torrent, every shower occasions a flood, and after a few days of fine weather the current falls so low that it is necessary to change the water wheels, because those of the old construction no longer are able to drive the machinery, and, at last, to introduce a steam engine to prevent the stoppage of the works for want of water."

In his "Über die Entwaldung der Gebirge," page 20, the same writer records the following instance of a reversal of this process, followed by its confirmation in the same manner as in the first case cited:

"The Wolf spring in the province of Soubey, furnishes a remarkable example of the influence of forests upon fountains. A few years ago this spring did not exist. At the place where it now rises, a small thread of water was observed after a very long rain, but the stream disappeared with the rain. The spot is in the middle of a very steep pasture inclining to the south. Eighty years ago the owner of the land, perceiving that young firs were shooting up in the upper part of it, determined to let them grow, and they soon became a flourishing grove. As soon as they were well grown, a fine spring appeared in the place of the occasional rill, and furnished abundant water in the longest droughts. In 40 or 50 years this spring was considered the best in Clos-du-Doubs. A few years since, the grove was felled and the ground turned into pasture, and it is now as dry as it was 90 years ago."

In his "Physische Geographic," page 32, Hummel gives the following confirmatory instance: The influence of forests on springs is strikingly shown by an instance at Heilbroner. The woods surrounding the town are cut in regular succession (by legal enactment) every twentieth year. As the annual cuttings approach a certain point, the springs yield less water, some of them none at all, but as the young growth shoots up, they flow more and more freely, and at length bubble up again in all their original abundance."

Cantegril, in "Ami des Sciences" for 1859, cites the case of a brook in the province of Labruquiere, which, as the forests around its source were allowed to grow, would increase in its volume of water, and, as they were cut off, would fall off in the amount of water. The writer states that in 1840 the stream was sufficient to turn the wheels of eight mills along its course, but, by the removal of the timber, gradually failed. Finally, when by legislative enactment the forests were preserved, it resumed its former volume and value as a power. This Cantegril sums up as follows:

"This example is remarkable in this respect—that all other circumstances having remained the same—the changes in the action of the stream can only be attributed to the restoration of the forests. Changes which may be thus summed up: Diminution of flood water during rains; increase of delivery at other seasons."

In 1857, Napoleon wrote as follows to his minister of public works: "Before we seek a remedy for the evil, we inquire into its cause. Whence come the sudden flow of our rivers? From the water which falls in the mountains, not from that which falls on the plains. The water which falls on our fields produces but few rivulets, but those which fall on our roofs and are collected in the gutters form small streams at once. Now, the roofs are mountains—the gutters are valleys." To this D'Hericourt adds: "To continue the comparison, roofs are smooth and impenetrable, and the rain pours off from the surface; but the rapidity of the flow would be greatly diminished if the roofs were carpeted with mosses and grasses, and, more still, if they were covered with dry leaves, little shrubs, strewn branches and other tree plants—in short, if they were wooded."

In summing up the question of the effects of forests, Becquerel ("Des Climats," pages 191-141,) writes thus: "Forests act as frigorific causes in three ways. 1. They shelter the ground against solar radiation and maintain greater humidity. 2. They produce a cutaneous transpiration by the leaves. 3. They multiply, by the expansion of their branches, the surface which is cooled. These three causes, acting with greater or less force, we must, in the study of climatology of a country, take into account the proportion between the forest and the surface which is bared of trees and covered with herbs and grasses. We should be inclined to believe a priori, according to the foregoing considerations, that the clearing of the woods, by raising the temperature and increasing the dryness of the air, ought to re-act on climate."

In referring to the great extent of the surfaces of the leaves of our forests, Gray, in his first lessons in botany, writes, "The Washington elm, at Cambridge, a tree of no extraordinary size, was some years ago estimated to produce a crop of seven million leaves, exposing a surface of two hundred thousand (200,000) square feet, or about five acres of foliage."

Prof. Marsh (Man and Nature," pages 177-178,) sums up the climate

effect of forests as follows: "They serve as equalizers of temperature and humidity, and, it is highly probable that, in analogy with most other works and workings of nature, they, at certain or uncertain periods, restore the equilibrium which, whether as lifeless masses or as living organisms, they have temporarily disturbed. When, therefore, man destroyed these natural harmonizers of climatic discords, he sacrificed an important conservation of power, though it is far from certain that he has affected the mean, however he may have exaggerated the extremes of atmospheric temperature and humidity. Or, in other words, may have increased the range and lengthened the scale of thermometric and hygrometric variations."

The effect of a forest in retarding the melting of snow is an important item in the consideration of forests as affecting the supply of water. Dr. Piper, in his "Trees of America," suggests the following experiment as illustrative of this effect: "A body of snow one foot in depth and 16 feet square, was protected by the wind by tight board fence about five feet high, while another body of snow, much more sheltered than the first, six feet in depth and about 16 feet square, was fully expose to the wind. When the thaw came, which lasted a fortnight, the larger body of snow was entirely dissolved in less than a week, while the smaller body was not wholly gone at the end of the second week."

It has been claimed, as against the above evidence, that our rainfall has decreased and that the amount now falling annually is much smaller than 40 years ago; if this is correct, the records should certainly show it, and we present below a record of the rainfall near Harrisburg for the past 66 years and, by a system of averages, we are able to show that there has been no material change in the amount of the rainfall. The record is as follows:

<i>Year.</i>	<i>Rainfall.</i>	<i>Year.</i>	<i>Rainfall.</i>	<i>Year.</i>	<i>Rainfall.</i>
1847.	38.50	1849.	42.10	1871.	42.48
1848.	37.97	1850.	54.54	1872.	48.36
1849.	41.85	1851.	35.50	1873.	55.28
1850.	45.07	1852.	45.74	1874.	46.25
1851.	43.94	1853.	42.26	1875.	40.22
1852.	39.87	1854.	45.23	1876.	47.39
1853.	48.55	1855.	44.66	1877.	37.26
1854.	34.24	1856.	33.52	1878.	34.53
1855.	39.30	1857.	53.02	1879.	36.75
1856.	42.66	1858.	38.96	1880.	33.58
1857.	39.04	1859.	54.48	1881.	30.21
1858.	45.30	1860.	48.90	1882.	45.58
1859.	43.73	1861.	43.22	1883.	32.17
1860.	47.41	1862.	44.58	1884.	39.34
1861.	55.51	1863.	49.65	1885.	33.35
1862.	48.58	1864.	42.24	1886.	37.24
1863.	46.86	1865.	49.12	1887.	42.17
1864.	40.15	1866.	43.58	1888.	52.55
1865.	40.03	1867.	61.20	1889.	65.06
1866.	44.38	1868.	46.94	1890.	46.08
1867.	45.21	1869.	43.21	1891.	52.25
1868.	34.99	1870.	43.55	1892.	39.65

Dividing this table into successive series of five years each, we obtain the following as the average rainfall of each period:

First period,	41.47 inches.
Second period,	40.92 inches.
Third period,	46.20 inches.
Fourth period,	44.00 inches.
Fifth period,	42.47 inches.
Sixth period,	42.28 inches.
Seventh period,	47.72 inches.
Eighth period,	45.83 inches.
Ninth period,	47.50 inches.
Tenth period,	47.50 inches.
Eleventh period,	34.47 inches.
Twelfth period,	37.54 inches.
Thirteenth period,	51.62 inches.

From the fact that the shorter periods are more liable to be affected by exceptional rainfall, as was the case with the thirteenth period above, when the result was greatly affected by the enormous rainfall which characterized the Johnstown flood, and which amounted almost to a cloud-burst in the locality in which the record was kept, we will make the comparison by periods of ten years each and obtain the following results:

First period,	41.20 inches.
Second period,	45.10 inches.
Third period,	42.38 inches.
Fourth period,	46.78 inches.
Fifth period,	47.50 inches.
Sixth period,	36.01 inches.
Seventh period,	49.63 inches.

It will be noted that the seventh period only contains the average of six years and that among these six we find the extraordinary rainfall of 65.05 inches for the year 1889; if the rainfall of that year is reduced to a fair average, not taking the excessive rainfall above alluded to into consideration, we would reduce the average of the last period to about 41.25 inches.

The general average by periods of five years is 43.81 inches; the general average by periods of ten years is 44.08 inches, and the average for single years is 43.75, thus showing that, practically, there has been no change in the general average rainfall of the district for which the record was kept.

After a careful review of different authorities, and an equally careful examination into the facts as they exist in our own country, we think we are fully justified in assuming the following conclusions in relation to the varied effects of forests upon temperature, rainfall and climate.

1. That forests do not materially affect the average annual rainfall. This is to say, if a record could be in any way be obtained of the total amount of water which passes Harrisburg annually in the channel of the Susquehanna, and a record for ten or more years be kept, it would be found that the amount thus passing from its headwaters to

the sea did not materially differ, neither from year to year, nor from the annual average of the amount which passed down fifty or more years ago.

2. That the average annual amount of rainfall now, as compared with that of 60 or 70 years ago, does not show any great variation, provided a considerable series of years are taken into consideration, and that we do not compare selected single years with the rainfall of past years.

3. Admitting the correctness of these two propositions, it follows that forests regulate and affect the distribution of the rainfall, even though they do not affect its total amount. Or that, in other words, the amount of water in our streams remains about the same as formerly, but its distribution is very much more unequal.

4. The reasons for this are numerous, and acting all in the same direction, they, although insignificant in their individual effects, produce effects which are sufficiently great to demand the care and attention of the State through its Legislature, and which annually causes losses to farmers and lumbermen which could, by re-forestation, be almost entirely avoided.

5. That the forests at or near the headwaters of our streams serve, by the loose and porous condition of their soil, to retain the surplus water of the rains, like so many sponges, and, giving them off to the springs which feed our rivers gradually, prevent sudden freshets and, without having in any way increased or affected the annual rainfall, equalize its distribution.

6. That forests, by sheltering the snow fall of our winters, prevents it from melting suddenly during the first few warm days of spring, and thus finding its way rapidly into the rivers to produce disastrous freshets and to cause losses along the stream below.

7. That the main effect is caused by the shelter afforded by the leaves while on the trees, and to the soil after they have fallen, and that, therefore, it is a mistake to imagine that we must, in all projects of re-forestation, wait for a generation before the effects are felt. Numerous cases might be cited in addition to those given, in which these changes have been produced within the memory of those living.

8. That if leaf surface and bulk of leaves to a given area are the items needed, it follows that a low and compact thicket may produce as great climatic effects as the more stately forest with its mass of leaf surface at the tops of trees, and that from its very start, replanted forests begin to assert their effects, and that after the whole surface has been well covered, results should be noted, slight at first, but increasing gradually as the amount of leaf surface and soil protection increases.

9. That springs now dry may, by the planting of trees and shrubbery near their sources, be increased quite as rapidly as they have been caused to fall off by the destruction of the original forests, and that these results may be expected within the range of an ordinary life-time, and that the general view that re-forestation is a work for the benefit of the next generation and not of the present, is an error, and that the time to begin is now.

10. That it will not do to assume that, in all cases, rainfall is in proportion to the area covered with forest. That Great Britain, with a forest area of but 5.5 per cent. has a greater rainfall than France, with a forest area of 16.79 per cent; that Sardinia with her forest area of

12.29 per cent. has a greater rainfall than Sweden with her 60 per cent.; and that there are other causes at work which so greatly affect rainfall that no general rule which does not take into consideration these causes, can be laid down for our guidance.

11. That, owing to other causes than forests, the rainfall sometimes increases. Thus, the level of Salt Lake has each year been slowly rising in a ratio utterly disproportionate, and in no way (apparently) connected with the question of forestry. That soils covered with grass will, in a similar manner, assist in the equalization of moisture, and that they, by preventing to a greater or less degree, the disposition to wash, also prevent the sudden rush of the water from the side-hills to the valleys, and that a soil entirely free from vegetation loses much more of its earth and offers less hindrance to water in motion than land upon which grasses or other vegetation are growing.

12. That the most difficult integer in the forestry problem is the prevention of forest fires which annually do more to prevent the re-forestation of our State than any and all other causes combined, and until this integer is solved, all attempts at re-forestation will prove more or less abortive because a carelessly started fire will, in a few hours, destroy the work of as many years.

13. That thus far no practical manner has been proposed for preventing the loss by forest fires. The plan proposed by Thomas Meehan, Botanist of the Board, of cutting lanes sufficiently wide to prevent the passage of fire from one division of the forest to another, is the most practical, but the expense is greater than the present owners of this class of lands are willing or able to bear.

14. That the removal and careful burning of all trimming, brush and dead tops would do much to prevent losses by fire, and if accompanied by some system of fire patrol, might do much to mitigate the evil. Under the present system a forest fire usually burns until extinguished by a rain, it not being the duty of anyone to combat it.

15. That there are, at and near the head waters of our larger streams, large areas of lands, once thickly forested, but which now, owing to forest fires, does not re-forest itself, which, under a proper system of State control, might be made to produce a profitable growth of timber, which, in the course of a few years, would make its effects felt in adjoining parts of the State.

16. That it is useless to talk of the preservation of our original forests; as soon as the timber reaches its most profitable condition it should be put into the market, and any plan which proposes to permit timber to stand after its most profitable condition is passed, cannot prove either profitable or popular, and hence the best that can be done is to encourage the land owner to get his land re-forested as soon as possible, not only for the interests of the State, but also for his own interest.

17. That planting high-priced land with trees merely for the climatic effect will never prove profitable; that the plan of planting our higher priced arable lands with timber, even of the most valuable kinds, is of questionable utility and without profit, and that we should encourage the planting of timber upon such lands as have either a low agricultural value, or which have no value whatever except for the timber which they will grow.

THE RAISING OF EARLY LAMBS FOR MARKET.

BY JASON SEXTON, *Member from Montgomery, Springhouse, Pa.*

You will not expect me to write up the history of the sheep and its conquests from Adam's time until the present, with poetic diction, or describe the glories of Mary's lamb, "whose fleece was white as snow;" nor repeat the stories so often told us by our grandmothers or great grandmothers (and many of them told us by our mothers) who, in their younger days, and while their husbands were laboring hard from early dawn until late at night, planting or hoeing the corn and attending to the other driving work of the farm at that very busy season—how our mothers would shear the few sheep kept almost solely to supply the family with clothing and, perchance, an occasional leg of mutton for the table—how she would, in addition to her other household duties, and care of the children, for days and weeks and months and almost night and day, by the dim light of the tallow candle, spin and weave, for a whole household, all the cloth needed to comfortably and neatly dress each member of the family, from the heads of departments down to the "tiny tot." In fact, they were not well dressed unless their clothing was made from the cloth made by some of the heads of the family, who knew how every thread was made, how the cloth was woven, and who wove it. I remember well, in the days of my boyhood, when my father, then a member of the New York Legislature, could not procure an overcoat good enough to wear at the legislative session except it was made from home made cloth, the wool of which was carded and spun by my own dear mother. No shoddy in those days, for they were the days of solid, honest, goods—made of wool that had not been pulled over the eyes of either protectionists or free traders. And the girls never seemed so beautiful and lovely as when dressed in their new flannel suits of "linsey-woolsey" dresses, and, with their rosy cheeks, were the very pictures of health. The boys, stout and rugged, never had use for an overcoat until they had attained their majority and were able to procure one for themselves. The kind of men and women given to the world in those days, by our noble ancestors, were such as will ever be the theme of story and of song, and whose virtues and many excellent traits of character we shall ever emulate and applaud. I would not move the "hand of time" backward on the "dial of progress" for a moment, nor would I have the young men and ladies present think for a moment that those were better days and better times and better people than now—no, not for a moment; it is the present we have to do with, and I want the young men and ladies here to ask themselves, in the light of their surroundings, and all their great advantages and privileges over the young men and women of those days, these questions: What can we do to make home happy and pleasant? What can we do to lighten the burdens of a careworn father or mother? What niche in the great sphere of life can we fill that the world may be made better and mankind happier by our living in it? And when you have

wisely and practically answered these questions, you will have fulfilled in part, at least, life's great mission, and in a measure will be answering the great end of your creation.

But pardon me. I did not intend to stray thus far from my subject; it was sheep and lambs I was to talk about, and not so much about their wool; but as I have always found the wool, until taken from the sheep's back, a part of the sheep and a part of the income to be derived from the sheep, I cannot well talk about them without bringing in their wool as a part of their product.

The old Spaniards understood full well what they meant when they said, "the tread of the sheep is golden," and as truthfully can it be said by many careful shepherds of this country, that not only has their tread been golden in making rich the pastures and barren soils over which they have trod, but have brought many golden harvests to their owners, and with happiness and plenty to the household.

To become a successful shepherd requires that one should have a liking for the business, with a kind and even disposition, and a determination to make it a success—not even ready to abandon it when adverse winds blow and seasons of depression and bad markets come, as they surely will in this, as in every other business. For the rule holds good in this as in every other business, that the men who stick closely and attentively to their business, early and late, in season and out of season, are the ones who succeed, and, as a rule, their success can be measured by their close attention to business.

Having decided to engage in the business, the selection of a suitable farm should be his first care before devoting his entire time and capital to the rearing of sheep and lambs. Those practical farmers before me know that land most suitable for sheep is naturally drained, with sandy loam or gravelly soil, stony, it may be. It should be rolling and may be hilly, no matter how rough. If it will only produce even short, fine herbage, and all the better to be mixed with clover. Low lands and marshy fields will not do for sheep. They only bring disease and death, and will soon ruin the best of flocks. No domestic animal is so readily affected by adverse circumstances as the sheep, and none seem to have less spirit and power to resist them. The experienced sheepmaster knows that success with sheep is never gained without merit nor lost without deserving, and failure is not the want of "luck," but the consequences of ignorance and bad management. Hence, the sheep must have a dry foot or disease is sure to follow, so that in the care and feeding of our flocks we will find that the quality of herbage depends largely upon that of the soil, and the character and quality of our sheep depends and is governed largely by that of the pasture.

After having thus wandered from my subject, I come back to it by saying that for the money expended, the care and attention given, and the food consumed, that none of our domestic animals will yield so quick and ready a return and so fair a profit as the sheep.

So far, I have tried to give a few of what I consider the requirements of both the shepherd and the lands. I will now try and give you some of the methods as practiced by us for several years past upon the "Record Farms." Our first study was to manage, or so try to manage and control our flock as to get the largest possible return from, in both the production of wool and lambs. Located as we are, in the midst of a dense population, near the great cities, the market

for high quality lamb and mutton must ever be upon a basis that will bring a fair profit to the thrifty farmer who wishes to add the production of early lambs, as a source of quick and ready income, to his already good market trade.

We found, as we commenced the business several years ago, that the selection of good breeding ewes was an important factor in the line of success, and we have since learned that when we have properly done this, we have made a great advance on the road to success. Time will not suffice, neither do I care to tell of all the mistakes we made, but we have learned that the successful breeding of early lambs for the market, to be disposed of from 40 to 50 days old, does not depend or require the use of pure bred, registered ewes, with their corresponding high prices. Of course, those will bring fine and beautiful lambs, of which the owner will be proud, and for which he deserves much credit, but they will bring no more from the butchers than the lambs just as fat and just as heavy, raised from a good grade ewe that has not cost one-third of the money. Hence, we have learned to use good grade ewes, and of the best mutton breeds that will sell best on the market; and, as we select them at the stock-yards, we try to get them large and roomy, weighing from 100 pounds upwards, from two to four years old, with good mouths, good feet and good udders. We prefer grade Southdowns, or any of the dark-faced mutton breeds. I say black-faced—not that they are so much better than many other breeds, but because the butchers always prefer them; and I have noticed they will often, in making their selections, take an inferior lamb for the simple reason he has a dark or grey face. So we have learned to cater to their wants and wishes in this regard, as we grow the lambs for the market, and wish always to dispose of them as soon as we can get them ready for the butcher, and when they will bring the best prices.

When we have once secured a flock of ewes that are satisfactory mothers and good milkers, we have learned to continue them in service as long as their teeth continue good and they winter well, as they breed earlier and are much more likely to give us an early lamb than one that has been accustomed to later breeding. As soon as she fails to give satisfactory results, we dispose of her to the butcher to the best advantage we can; but, unlike many other domestic animals, she never dies in our debt. When we are again compelled to go to the stock-yards, or elsewhere, to fill the places of those we are obliged to dispose of, we try to get them home early—say not later than the first of July, and after two or three weeks rest and feed, our pure bred Southdown rams are then placed with our divided flocks, which should not exceed 30 to 40 in the flock. They are allowed the run of the stubble fields and the after-growth of the hay fields during the fall months, and seldom require other feed than what is there afforded. However, if we have plenty of pumpkins or turnips, we find they are very fond of them, and are hauled and spread broadcast from cart or wagon in the fields; and if the weather is not wet, they do not require to be housed, even at night, before November 20 or December 1. They are then housed in good, convenient pens, of not more than 20 to 25 in a pen, with an outside yard attached to each pen, that they may have plenty of exercise. The pens are so arranged that all can be closed inside during wet and cold rain storms, with plenty of water in each pen. They are fed from then on until near lambing time on

plenty of rough, coarse fodder, any coarse feed, and from hay that we wish to have tramped up and made rapidly into manure, the pens at all times being freely littered with straw, as sheep will never do well or pay their owner a profit in wet, filthy pens. With this fodder they are fed in addition a daily ration of about one and a half pints of bran, oats and corn, the greater bulk of which is bran. As lambing time approaches, the most forward ones are placed by themselves in smaller pens, or the large pens are divided so that not more than 12 ewes are left in a pen. They are now placed on better feed, say all the clover hay they can eat, and no corn, but the ration of oats and bran is increased. They are closely watched, and we try to give them the best of care and attention, as the weather is cold and we wish and are anxious to save all the lambs. To aid in doing this the outside doors are kept closed at night and tightly banked at the bottom to prevent all drafts of cold air entering the pen, the ventilation being arranged by means of windows and slides, so that no direct draft can reach the body of the pen. So we leave the occupants of that pen quietly resting, as we leave them late at night; and if on entering that pen early in the morning we find a little stranger, or two of them or more, we will, in 99 cases out of 100, find him nursing a happy mother, or resting quietly by her side. But should an emergency arise and help be needed, the quick eyes and gentle hand of the experienced shepherd will soon set all matters right.

As the lambs increase in numbers and age, they must be fed and cared for outside of the ration given them by their mothers. To do this the grain ration is increased again to the mothers, and a small pen is made in one corner for the lambs, in which a "creep" is made for the lambs, but through which their mothers cannot pass. In a small trough, out of reach of the mothers, is placed a little bran and ground oats, which they very soon learn to eat; also a small rack, in which is placed a little of the finest and best clover hay, saved especially for this purpose, at which they soon learn to nibble, as they like to keep out of the way of their mothers when they are feeding. In a few days a small pinch of sugar, which aids largely to increase the appetite and growth as well, is mixed with the bran and oats, with a very little corn meal added. No more should be placed in the trough than they will eat up cleanly each day. Care and judgment of the feeder is one of the great requisites to the successful feeding of these young things, who will now pass through their creep a dozen times a day to get a nibble at their feed. Now they should be given all they will eat, but no more. In this way and on this line, the feeding is continued until ready for the butcher, which is usually at from 40 to 50 days old for the earliest ones, and from 50 to 60 for the later ones. We aim to have all disposed of by the first to the middle of May, or before the mothers are turned to grass. The lambs weigh, when disposed of, from 35 to 45 pounds for the earlier ones, and from 40 to 60 pounds for the later ones. Our great study is to have them fat. Prices are not as good as formerly, as many more are being raised, and they are now being crated and shipped into our markets from long distances; but the demand is still good and has kept fully up to the supply, and I have no fear of the business being overdone, for the demand seems to increase with the supply. As I have said, we now add the value of the fleece of each sheep which, by the first week in May, has been shorn, to the sale of the lamb, or the amount received

for him. So we have as an average for the lambs, \$6.00, and for the wool an average of about \$1.75, unwashed, making about an average of \$7.50 to \$8.00 per head, as the income of each sheep for the care, and attention and feed given. While to some of us this may seem low, I question if even our best dairymen, under the best conditions, can show better results. Now, I would not advise even an unthrifty dairyman to give up his dairy and turn to sheep, for I believe that the farmer who, under ordinary conditions, cannot make his dairy a success, will be very apt to fail in the little details required to make a success of raising early lambs; but if he would like to try the business, I would say to him, "Keep your cows," and for the present make the raising of lambs only an adjunct to the dairy, for the farmer whose buildings are fitted for the dairy and built for that purpose, should be slow to change to a business he has yet to learn, and of which he knows comparatively nothing. The better way would be for him to start with a few good ewes. Have them bred early (and I would have him remember that success depends on their being bred early), for it's the early lamb that brings the satisfactory price. If he has no small shed he could turn into a sheep pen, he could cheaply place a lean to against some of his buildings that would last for a few years or until he had gained some little knowledge of the business, and buildings. Should he then have a love for the business, he will be reasonably sure of success.

To the careful farmer who is desirous of increasing and adding quickly to his income by the investment of a small capital, and who wishes in some way to surely lift the mortgage that has hung like a dark cloud these many years over a happy home, and who has been struggling, with his devoted wife, to secure for themselves and their children, a home with all the word implies, in which they may quietly retire in the evening of life, happy in the assurance that they have done what they could to bless the world and make mankind better—to such I would say, that by judicious investment and careful handling, such as would be expected of them in caring for a few good sheep and lambs, would not only prove a source of sure profit, but would soon become the pets of the household and a blessing to the children.

Much more might be said of this most noble animal. Much more credit might be given them. They deserve much credit as scavengers and as the renovators of wornout pastures, and for the cleaning up of weeds and hedges, and for the restoring of wornout soils, but I forbear, for I have already wearied your patience, and I shall be pleased and more than rewarded if I could feel that I have induced a single progressive farmer to study this question, or have added a single friend to this most neglected animal.

AGRICULTURAL EDUCATION.

BY JOEL A. HERR, *Member from Clinton, Cedar Springs, Pa.*

If there is any one class of people who need to be educated more than another, it is the farmer. When we consider that upon the suc-

cess of his industry depends the prosperity of the whole country, its importance becomes plainly manifest. The total failure of his crops for one season would be a disaster which cannot be measured nor comprehended. If then so great importance attaches to his pursuit, how important is it that it be conducted with intelligent zeal. Those who farm with most intelligence are usually most zealous in their labor. There is no occupation so diversified in its requirements as that of agriculture. There is not a single department of it but requires great skill and unusual intelligence to reach the best results. It is also painfully apparent to the most casual observer that farmers, as a class, are woefully deficient in that kind of education which is necessary to obtain the best results from their labor. If this be true, how important that an effort should be made to supply that want. Agriculture is a lifestudy and should be begun in youth; yet none are too old to learn. We will endeavor to point out a few of the more common things which the average farmer ought to know more about, to farm successfully. How many of our farmers understand the principles of judicious feeding of stock? I venture to say that the majority of farmers lose more by injudicious feeding of stock than would pay half their taxes or possibly all their taxes, which is often an item of great importance.

How much is annually lost for the want of knowledge of the proper adjustment, handling, and care of machinery?

How much money is actually wasted each year by the use of fertilizers which are put on without any knowledge of what the soil needs? How many farmers are trying to make a living by raising scrub stock and by keeping milch cows, which, if tested, would prove to be a constant loss to them?

How great a proportion of farm work is done in a hit or miss, haphazard way, without system or order. Many of our farmers still wait for propitious signs to guide them in their work. What a field for the educator!

How is this much needed education to be acquired? 1. By farmers' organizations where experiences are compared, and farmers learn from each other. 2. By farmers' institutes and similar meetings where people gather from greater distances and some scientific and practical instruction is given. For older persons these are probably the most desirable means of acquiring practical knowledge of carrying on farm operations successfully. 3. By reading good, reliable agricultural newspapers and books. Book farming is not to be despised if it does not always fit each individual case. 'Tis here where the educated man discriminates, and applies the knowledge and experiences of successful farmers elsewhere, just so far as they are applicable to his conditions. 4. By our agricultural schools and colleges. It is here that the highest degree of scientific agricultural knowledge is obtained, and persons are fitted to be leaders of their class in any branch of farming, as well as thoroughly equipped for the practical duties of husbandry in all its departments. Scientific agriculturists are scarce and in demand. In all the field of literature, science, and arts (to my mind), the greatest in its needs and possibilities is the science of agriculture.

Young man! hesitate before you choose a life's vocation, and see if agriculture cannot show inducements equal to any. The field is inviting. The labor is needed. The compensation is ample. The

work is healthful. The opportunities for advancement are great. To those who cannot afford to take a full course in scientific agriculture, the shorter courses commend themselves. These combine practice with science, and are calculated to do a great deal of practical good by qualifying a person, in the shortest possible time, to understand and apply the most modern thought and device in the realm of agriculture. For those who cannot leave home to take even the shorter courses in agriculture, a system of agricultural reading on the Chautauqua plan has been devised by the Pennsylvania State College which shall cost nothing but the books. This system commends itself to all, and, if adopted, will be the means of diffusing a great amount of information on the most important subjects of interest and practical benefit to the every-day farmer. It will serve to broaden the scope of his vision and reveal to him, somewhat, the extent, as well as the variety and importance of his avocation.

The educated farmer is in demand, not only as a tiller of the soil and a producer of the very best articles which grow from the soil, but he is needed as a citizen of prominence and as a representative of his class. Every pursuit has its leaders and its champions, and the farmers need theirs. They are needed to fill the various local township and county offices to which they may be called. They are needed to represent their class in legislative halls and in the councils of our government in the proportion to which their numbers and the importance of their business entitle them. When farmers are well qualified to fill these positions, there will not be such a preponderance of professional men in our law-making and executive positions; and when they are called to fill them they will not be euchred out of their just and equitable share of everything but taxes. The neglect of proper legislation, and the overflow of corrupt partisan measures, will then be less common; our public schools and other educational institutions, as well as our charitable institutions, will then receive the consideration which is due them. Exacting corporations, formed for greed and tyranny, will be held in check, and stock gamblers in our products will be a thing of the past.

The honesty, industry, and integrity of the farmers are the safeguards of the nation. How important then that, as a class, they should have a superior education, not only in the line of their particular avocation, but in general business principles and matters of public concern. Do not, then, underrate the value of an education, either technical, or scientific, or literary to the farmer.

In the aggregate, the farmer's boy has the advantage of the city boy in means to acquire an education. True, he has not in his early common school life equal advantages, on account of the superiority and length of term of city schools, but he has purer air, a stronger constitution, better health, and a power of endurance, which, to an ambitious youth, is the great desideratum in the struggle for supremacy. The vast majority of the best and most successful business men in the cities to-day, were country boys who grew to manhood in the country, and carried with them to the city that energy, ambition, and thrift which were bred in the country.

Among our most profound scholars, our greatest theologians, our most eminent jurists, our most distinguished statesmen, our most successful generals, are to be found very many who came from comparative poverty and obscurity in the country. What an encouragement

to the youthful countryman, and an incentive to lofty ambitions, these facts present.

The popular thought that anybody can farm, and that a farmer needs but little more than a common school education, deserves to be thoroughly exploded. The idea that all the instructions he needs can be acquired by his own observation and experience, is a fallacious one. The experience of a world of practical and scientific farmers should be at his command. As well might he compare his own locomotion with that of the steam engine drawing long trains of loaded cars at twenty-five miles an hour, as to try to compete with the progressive agriculture of to-day without availing himself of the results of experience other than his own.

We are living in a day of great advances in the science of agriculture. No period in the history of our country can boast of the widespread progress in both the science and art of agriculture, in all its varied branches, as to-day. With a full department of the government in our interest, and with agricultural colleges and experiment stations in every state in the Union, whose bulletins reach almost every progressive farmer in the country, we feel that we can justly boast of unexampled progress.

Let us then be wide-awake to our duties and privileges, and not be found impediments on the track of the car of progress. Do not decry or belittle our industry, but rather aim to give it that prominence to which it is rapidly developing, and which is its rightful position among the industries of the world.

HAY AND HAYING.

BY LUTHER GATES, *Member from Crawford, Beaver Centre.*

The hay crop is brought into unusual prominence the present season by the scarcity in foreign countries, especially England and France. It has the effect to make prices very high in this country, to start with, but the reaction has already set in, which bids fair to make prices lower than they were a year ago.

Many farmers will turn their attention more to producing hay, and the inquiry will be, how to produce it the most profitably. The first thing to consider is the seeding down—getting started. I will only speak of timothy and clover, as they are all that are usually recognized in the markets that we are interested in.

The most common plan, where wheat or rye are grown, is to seed with grain. There are objections to seeding with grain. If the timothy seed is sown in the fall it is quite likely to injure the wheat, while if it is sown in the spring and the wheat is heavy and lodges, some of the grass is liable to be choked out. Generally, we have fair success by seeding with oats unless it should be hot and dry when the oats are cut. It is probably a safer plan for a hay farm to sow grass seed alone.

We are experimenting some this season. Some of our seeding with

oats failed. After the oats were off we worked it up with harrow, and re-seeded. We did the same on land that had produced buckwheat. We removed the buckwheat on September 18, and the next day worked it up and sowed 10 quarts of timothy and, on a part of it, oats, about two bushels per acre.

If hay is to be sold, grain should not be raised, but meadows could be renewed, when necessary, by turning over the sod as soon after the hay is taken off as practicable, and keep it loose and fine until time to sow wheat, working in from 200 to 500 pounds of some good fertilizer per acre; and sow 10 or 12 quarts of timothy seed; the former, if clover, is to be sown in the spring. In this way you may expect two-thirds of a full crop the first year, with the probability of a better crop for the succeeding years, as the land has not been exhausted with grain crops. Land that is adapted to grass will usually hold good for three to five years without fertilizing, and may be kept productive much longer by manuring, which is done best by spreading on the land during the late fall and early winter. But if market hay is the object, it is best to seed often enough to keep the quality up, as the prices are from \$2.00 to \$3.00 per ton higher for choice timothy than for grades that are mixed with other grasses and clover.

When to harvest is an important consideration. It generally happens that a farmer is obliged to begin early and finish late, but he should push the hardest at the time it is nearest right. If he has some newly seeded that is part clover, it will be necessary to cut that earlier and be ready for the main crop with tools and machinery on hand and all in order, with repairs, such as sections and guards for mowing machines, forks for tedders, all ready, and everything that can be foreseen, provided for.

It is admitted that the proper time to cut clover is when it is fullest in blossom, which is usually when a few heads have turned. But, as in everything else, judgment is required. For timothy to make heavy hay, it should get all the growth possible and not form seed. It should not mature the seed, as there is danger of the roots dying and the quality of the hay is injured, and as appearance does very much toward making the price in market, we should work for that. But, if it is to be fed on the farm, the best time to cut is when in full blossom.

Hay with the seed shelled off looks bad indeed, and generally sells badly. It should be handled so it will not be bleached, stained or blackened.

You will excuse some reference to our home operations, as practice is better than theory in some cases. The old way of handling clover, to wilt it, put up in small cocks, let lie a day or two, or more, then air it, and if it is pretty dry, haul in. The new way, for a farm containing 50 acres of meadow, the outfit would be five horses, two mowing machines, two wagons, one tedder, one loader, one rake, elevating apparatus, three men, one boy. Programme something like this: Begin cutting clover after the dew is off, or say 9 o'clock. If the mower bunches very much, have a man follow and spread out the bunches. After it gets wilted some, start the tedder. It should be tedded again just before the dew falls, if it has dried much, so as to have the dew fall on the portion that is not dried so it will not injure the color. As soon as the first two swaths mowed are dry, (we will presume that the two swaths around the field will make a load), start the wagon

with the loader attached. It requires three horses, and is better if hitched abreast. It also needs a good man to run the loader. Now go ahead, mow just enough to keep all moving. Don't haul any after the sun gets low unless it is getting too dry. Mow awhile with two teams just before night. Keep the tedder going; clover may need tedding three times or more.

Arrange a more convenient way to unload. Don't drive a load of hay inside the barn to unload. Cut a door in the gable, change the track and run the hay from the outside. Make time count, and save muscle.

To use two wagons, keep the best man in the field with the loader. Have a three-horse evener that can be changed quickly. Shift the three-horse team to the empty wagon. With the two horses take the load to the barn. Have one man in the mow. If you put the hay in at the end of the barn you will have plenty of room to throw off a load quickly, and let the man take care of it while you are after another load. While you are hauling with two wagons you will need two boys, one to drive the loading wagon, and one the horse fork.

After the clover is all secured, it will be time to begin the timothy. Better to cut some a little too green than too risk it getting too ripe. Keep a good lookout and cut where it is the most mature. As with clover, it is the heavy growth that gives the most trouble in curing properly. Once tedding is usually sufficient if it does not exceed one and a-half tons to the acre, but if it is heavier it is better to ted more and get it dried more evenly. The heavier, that is, the less drying it has, and come out sweet, the better. If the life is dried out of it, it will stay out. It is not running much risk to put in a load or two quite green if there is plenty of sunshine in it, and the further precaution is taken to put some over it that is quite dry, to take up the excess of moisture.

It frequently becomes necessary to stack some hay, which can be done at a great saving of time and muscle by elevating by horse power. Provide a strong pole 35 or 40 feet long and stay it up with ropes, letting the top hang over where the centre of the stack will be. By having the pole high, the hay goes up nicer and is easily handled by the man on the stack. One man can handle as much in this way as two can in the old way, and make a much better stack, because it is easy to keep the centre full all the time, which is the essential thing in stack building.

Prefer a round stack, because in a rick there is so much danger of damage by water running in. If such stacking is to be done, you should have a stack cover or two, and let the body of the stack settle before finishing. Two, or even three, large stacks may be built without taking the pole down, by changing the guys. Hay may be kept a month or two in stack with scarcely any loss if properly stacked.

The expense per ton of putting up hay depends on so many things that it is difficult to give a very close estimate. If it is not a very long haul, say from nearby to half a mile, and large fields, and with a good outfit, it can be put up for 75 cents to \$1.00 a ton.

THE COUNTY FAIR.

BY W. H. H. RIDDLE, *Member from Butler, Butler, Pa.*

The county fair, its management, its object, and its value as a public educator, is a topic of importance to every one who feels an interest in the sturdy growth of the several branches of industry which make up the grand total of our Commonwealth. As an incentive to the progress of agriculture in all its phases, whether it be the husbandman or the stock raiser, whether it be the market gardener or the poultry fancier, nothing adds so much zest to the pursuit or induces greater interest as fair and honest competition, under the proper management of a well regulated agricultural association. The progressive farmer of today can no more afford to stay away from his county fair than he can to stay away from the markets. In fact, it is by attending the fair that he learns what the markets demand. Some one says fairs are failures; that they only last a few years and are then re-organized and, as a consequence, do but little good. Careful management will make any business succeed. The business men of a community who manage fairs as they do their own business, and who feel that all their official acts must be conducted in fairness, on the principles of common honesty and fair-dealing, and a proper regard, as well as due respect for the customs of well regulated society, will have the confidence of the public, and will, as a consequence, succeed. Success in this line depends solely on acquiring the perfect confidence of the public. In order to accomplish this result it is only necessary for the management to seek to do right in their official conduct, without fear or favor. It is the mistakes of managers that make fairs unpopular. The due regard for the order-loving citizen, without catering to the wishes of the over-scrupulous, is sure to induce confidence.

Much of the mismanagement, however, is the mistaken idea of the object of exhibitions called fairs. If the object is simply money making from whatever source money can be realized the surest, it will require but few exhibitions to bring the society into such disrepute that they will not need to be told the adventure will fail. Many men who esteem "gaming" for money the curse of society, are ready, as managers of an agricultural society, to close their "religious eye" to this society evil, where it enhances their profits and, as a consequence, permit gambling, though, in many instances in modified forms, as a source of revenue.

As said by Artemus Ward, they look upon it with the "calm confidence of a Christian with four aces," and appease a lashing conscience with the reflection that they approved of it only in their capacity of managers of the agricultural society. If that couplet which thus describes gaming be true, viz:

"The love of gaming is the worst of ills;
With ceaseless storms the blackened soul it fills;
Kills health, palsies power, plunges in disgrace,
And turns an angel's to a demon's face,"

Then the management who permit it, take upon themselves a wondrous responsibility.

But, says some one, the people must have amusement. Accepting this as verity, it does not mean that the vicious are to force upon the order-loving citizen the curse of society, or that their games are pursued honestly; its very object is methods of cheating. In Pompeii ruins, loaded dice were found, proving that such methods are of very remote origin and in keeping with those who follow it.

The real object of agricultural fairs ought to be understood by its managers as an exhibition of all the industries of a community, for which a small reward is offered to the most meritorious, not as a consideration, but simply as a reward of merit, as a stimulus to further improvement. And the class of farmers who criticise fairs because they do not pay the exhibitors in dollars and cents, either misinterpret their object or have yet to learn that fairs cannot be run for the purpose of "money making." It is only in the results which these exhibitions bring about that farmers are benefited, and results can only be effective to this end—if the management is what it should be. The stock raiser seeks to advertise his business by his showing at fairs, and thus attracts the attention of the purchasing public. As an advertising medium such exhibitions serve every industry. Besides this, another object is the social relations which such meetings cultivate. The agent becomes more fluent and genial as he recommends his wares, farmers meet and compare notes on the success of new seeds, some of which have probably been sent out by their congressman, who may want a re-election and must do something to remind his constituents that he is at Washington—seeds which were at one time all right, but which do not wear their years without losing their germs; but the farmer excuses the congressman, if the seeds do not grow, and is glad that he is remembered. The ladies and children enjoy the scene, and the race horse man is in his glory, because he is quite sure everybody has heard of his particular horse and has come to see him go.

Upon this feature of fairs, I assert that it is the duty of managers to furnish such amusements as are consistent with the well-being of society, and within the limits of its laws. Excluding gambling in every form, and if the laws of the land were rigidly enforced against every society which permits it, fairs would become more interesting and useful to the communities in which they are held. Trials of speed seem to be a necessary adjunct at fairs, but large purses for this purpose is a waste of funds. Moderate premiums for speed will bring out a class of horses which will give as good an entertainment and bring with it fewer of the train of gamblers who follow the race track.

The selling of general merchandise on fair grounds during fairs is not in keeping with their object and always interferes with home merchants. Eatables and specialties are a part of the make-up of such exhibitions, and must have a place on the grounds, but the grounds should not be made general market places.

In this age, many things go to make up the education of our people; primarily, our excellent school system, good literature, intelligent lecturers; these, combined with the world of observation, are the educators which strengthen our minds and broaden our views. Fairs serve their purpose in this line. They give the opportunity of comparison; they show the result of careful labor; they develop the per-

fect breeding of animals, and the growth of vegetables. From county fairs have developed State fairs, and with this closing decade of the nineteenth century, the World's Fair, as a further out-growth, will be one of the historical events of the age, and will add to the wealth of educational facilities with its grand buildings, its displays in every branch of industry—an opportunity never before offered.

Concluding, I assert that the pursuit of agriculture has been largely benefited by agricultural fairs; that stock raising has been advanced to the degree of perfection which it has now reached, and that, if properly managed, will ever be a necessity to the certain development of these pursuits.

ROADS AND ROAD LAWS.

BY HON. R. E. PATTISON, *Governor and President of the Board.*

(From an address at the Kittanning meeting.)

The road question has been so much discussed, and there has been so much written about it, that it seems unnecessary to add more. There is hardly a day but what I receive an essay, or a paper, or a magazine marked, referring to the road question. I think every shade of opinion, as I have read it, is the product of a sincere thought upon the question of our reaching out for the wisest and best solution of the road question. I am still of the opinion that it is a question associated very nearly with the question of taxation. The roads of our country cannot be improved in a generation without an enormous expenditure of money.

Speakers and essayists are in the habit of comparing our roads with the roads of Europe. The roads of Europe are 500 years old. Centuries have been passed in the construction of the roads of Europe. The traveling to and fro of generations of men and of commerce, has settled the road question of Europe. Then they were built at times when there were large armies, which took part in their construction. The Appian Way, which has endured through these centuries, was a road built largely out of slave labor and out of the armies of that day; and, compare it from that standpoint, the expenditure would simply be enormous.

The old Cumberland road, under the activity of Mr. Clay, who was an advocate of internal improvements and became an advocate of the National road in 1832, was commenced in our State, in Washington and Fayette counties, and, running through West Virginia, the nation expended, in the construction of that road, over \$5,000,000. As far as it went in our State, the cost of construction per mile was a little in excess of \$9,000 a mile. The road was 66 feet wide. Assuming it of half that width, and we would certainly be put to the expenditure, as far as I can gather, for the expense of a substantial road, to between \$3,000 and \$4,000 per mile. Now, then, if we are to have such substantial roads at such an expenditure, we must be willing to contribute the money.

I don't believe road building ought to emanate from the State. The State of Pennsylvania had a very unfortunate experience some 40 years ago in internal improvements by which it was involved in forty millions of debt, (and we have nothing today to show for it), and it has passed largely away from it. Of course, there were some revenues received from the canals, but nothing in proportion to the indebtedness incurred. My judgment is that the localities should begin the road improvement. I look upon the road question a good deal like the school question. There is a great deal of similarity between them, if followed out. We tried the solution of the school question before the days of Governor Wolfe, when the school question was like the road question and tax question of today. The question was not even then solved, but subsequently, by beginning at the bottom and establishing a graded system of primary, and a secondary, and a grammar and a high school, and then graded it in such a way that the localities freely separated it, because it was public and contributed to the education of all ages and all classes. The appropriations were originally (the older men may recall it), to the academies and colleges and not to the public schools, large sums of money, dependent upon the financial condition at those times, being appropriated to the academies; subsequently the public school system developed, which we have today. That system began by an appropriation, by the State, of about one hundred and fifty thousand dollars; it has now reached the sum of five millions and a half annually. To bring about this expenditure so as not to make it oppressive and get the largest results—for I believe today we are having the largest results of any other state—if we are to follow out the same with reference to the road question, then the localities must begin. It cannot be expected of the State to begin the road question at the end of the school question.

You have asked me to express myself. There is no difference of opinion between us about the importance of the road question. There is, however, little difference as to the construction of the roads, but when you come to the financial question, then the whole problem arises. If you assist the citizens in different localities where it is necessary to build good roads, then there will be trouble. We ought to confront the proposition with our willingness to pay for them, but I don't believe that it can be done by one generation, and it comes back, as the road question always does, in a circle. It comes back to the beginning, and that is that we must start with the road problem as we have with every other question. I do not expect that we will be able to accomplish in a day, in a year, or a quarter of a century, or half a century, such roads as we are constantly quoting in other countries, and our National road. Mr. McDowell, of Washington county, is here, and has some connection with it. The foundations of that road are now about as good as when they were put down. Outside of the tolls, I do not think there has been any appropriation by the State, except an appropriation of fifteen hundred dollars for the destruction of a bridge.

I have listened to the tire question. Let me say in reference to that: I have seen the streets of Philadelphia, during the month of March, as bad as any road I ever saw in Pennsylvania—any mud road. There are streets in the northern part of Philadelphia, the new portion of it, which have been recently paved with the old fashioned cobble stone, that, when the following spring would come around, the frost would lift them out and you would have ruts there two feet deep, and

it made it utterly impossible for wagons to go through to transact business. If that is true of a street in a city, how much more is it true in the country. The contractor has gone over it, placing the cobble stones back and filling it with gravel and passing the roller and rammer over it. Without any question of tires entering into it, that street is absolutely thrown up, interfering with the passage of wagons, so that it comes back again; it is not so much a question of tire as it is with the filling, the rolling and the ramming. If you put it down to a sufficient depth and have proper rolling, and all that, you will have very little difficulty about having it torn out by the frost.

POTATO CULTURE.

BY THE SECRETARY.

The Pennsylvania potato grower, who, during the past 20 years, has made the greatest profit out of the crop, has been one of those whose farm is within not less than 10 or 12 miles of a good market in which he can sell direct to the consumer and deliver the crop from his wagon. By this plan he, as much as is possible, avoids the evils of freight discrimination, reduces the profits of the middleman to a minimum, and brings the producer and consumer most closely together.

Whether the profits of the coming 20 years shall equal those of the past, is a question which can probably only be decided by the adoption of labor-saving machinery, for we have no reason to suppose that this crop will prove an exception to the rule that the introduction of machinery increases production and lowers prices.

The introduction of planters, diggers and sorters will enable the producer to largely increase the area planted, without very materially increasing the total cost of his crop, and by materially lessening its cost per acre; and it follows that if this decrease in the cost per acre, or per bushel, is proportionate to the decrease in market price, the profits will be as great as heretofore; but if, on the other hand, the substitution of machinery does not decrease the cost, we may expect decreased profits proportionate to the increased crop.

Wheat or grain may be sold in the open market in direct competition with others, but the potato grower, who can dispose of and deliver his crop direct to the consumer, must command a market which his more distant brother, who is compelled to reach the consumer through the commission merchant, and over a line of railroad with no competition, can better appreciate.

Customers want to know who raises the potatoes which they buy; they become used to the crop from certain kinds of soil and would not want the same kind of potatoes by the same grower, if from another soil. They soon gain confidence in the producer and will not object to giving him an advance over the regular market price in return for the certainty which follows the purchase.

Thus, our friend Terry can obtain from 5 to 10 cents per bushel more for his crop, not because they are necessarily any better than

his neighbor Smith's, but because they are raised upon Terry's soil, by Terry's mode of culture, sorted by Terry's men, and delivered in good shape and condition by him. His neighbor Smith's potatoes, if as fine in size and offered by Mr. Terry would, other things being equal, bring as good prices, but Mr. Terry's customers know that he will not offer them any potatoes but his own raising unless he is sure that they are all right. In other words, they are willing to give Brother Terry a bonus for the confidence which they have learned to have in him and his potatoes.

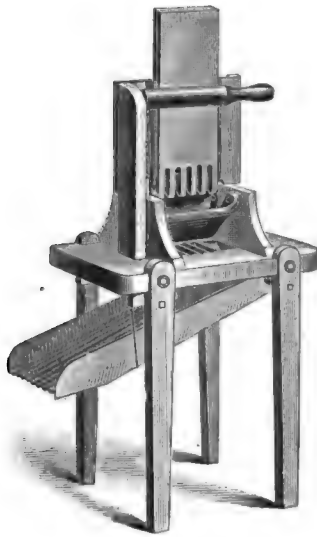
Butter and potatoes are two crops into which the producer may put his "individuality," and make it pay him. He may establish his brand of potatoes just as he can his brand of butter, and his customers will as well appreciate the one as the other, and will just as willingly pay for it.

Much, of course, depends upon the manner in which the potatoes have been handled. A lot of potatoes which, by too early digging, have been scuffed and rubbed, will never bring the top market price; many buy potatoes by the eye, very much as they do fruit, and such will not pay full prices for rough or poorly sorted tubers. This not only extends to the actual product, but goes beyond it and affects the surroundings at the time it is placed on the market. One of our local marketmen, a large producer of vegetables and having many regular customers, ran out of potatoes with which to supply his customers, and purchased a few baskets from the stall of a neighbor in the market nearby. Our friend prided himself not only upon the appearance of his vegetables, but also upon his own appearance and that of his stall. The potatoes, moved from his neighbor's stall close by, were emptied out of the old and ragged baskets into our friend's neat and new baskets, all branded plainly with his name in full, for he was not afraid of it and wanted his customers to know from whom they were buying. Customers, in several cases, approaching the other stall first, would ask the price of the potatoes and pass on and buy the same potatoes of our friend at an advance of 5 to 10 cents per basket. In this case there was no difference in the crop, and the change was entirely due to the man and his surroundings.

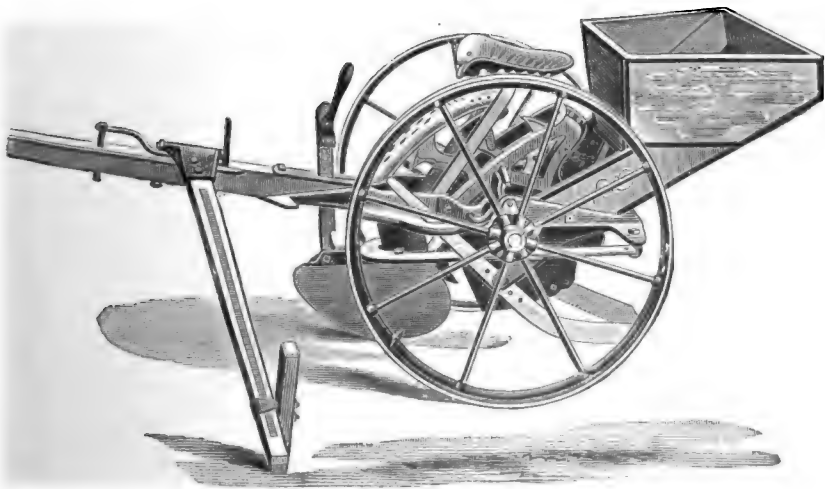
Having decided to go into the culture of this crop, the producer should decide upon the area which he will devote to the crop, and make up his mind to continue the production of potatoes in about the same area each year. The farmer who relinquishes the crop because potatoes are low in price, has missed his calling, and will usually miss the larger profits of the crop. He who each year plants about the same area, regardless of market price, will, in a term of years, make by far the greater profits from the crop. With this crop, as with all others produced upon the farm, it is safe to assume that the time to go into it is when others are leaving it. Usually unusually low prices are succeeded by better ones, and vice versa, and he who sticks to the crop is the one who will obtain the greatest average profit; and it is the average, and not the maximum, which counts.

PREPARATION OF THE SOIL.

In the rotation of corn, oats, wheat and grass, as is that usually met with in southeastern Pennsylvania, the place for the potato crop is in stead of oats and after corn; any other position in the rotation will more or less interfere with and disarrange the rotation. Our friend



1



2

1. POTATO CUTTER.

2. POTATO PLANTER.

Terry may (and justly does), advocate a clover sod, but the dairy farmer in southeastern Pennsylvania has other uses for his clover sod and cannot afford to turn it under, even for potatoes. Every acre of it means about one cow and a half to him, and the dairy product of this cow and one-half is too valuable to him to exchange for even a good crop of potatoes.

The best that he can usually do in the selection of his soil, is to take the most favorable portion of his last year's corn field and substitute potatoes for oats in his rotation.

Viewing the product from this standpoint of a grower who wishes to retain his customers, and who cares more for his total receipts than for the size of his total crop, we would advise that green barn yard manure should be applied as long as possible before the crop is planted or that, if close application is necessary, well rotted manure should be used.

Acting from this point of view, the manure should, if possible, be applied one year in advance of the potato crop or the preceding corn crop; apply to the best portion of the field intended for corn, a heavy dressing of manure, which will be plowed under the sod, and by the next fall or spring it will be decayed and in excellent condition for the potato crop; the corn will not have removed more of its fertility than would have been lost by allowing it to lay all summer in the yard, and, if the dressing has been a liberal one, there will be ample for the potato crop.

If the soil is naturally heavy and so situated that it will not wash badly, it will best to plow it as soon as the corn is off and carefully back furrow it so as to leave the surface in high, narrow ridges for the action of the frost during the winter.

Early in the spring, as soon as the soil is fit to work, split these ridges with a light plow, throwing the soil, as nearly as possible back into the furrow from which the fall ridging removed it, and plow carefully. If a commercial fertilizer is to be used (and no crop will better pay for its liberal application), one-half of the amount should have been sowed broadcast before plowing and the remainder retained for application in the rows at planting time.

For the general crop, do not be in too much haste about planting; taking the average season, the medium plantings do best. When ready to plant, mark out, with a four-inch furrow, in rows three feet apart, and, after sprinkling the fertilizer in the rows, drop the seed and cover with a plow. For marking out, an old fashioned "shovel" or "bull-nosed" plow will answer the purpose better than the common plow, and the loose soil, having been thrown out on both sides of the furrow, may be drawn in on the cuttings more readily.

PREPARATION OF THE SEED.

A discussion of the preparation of potatoes for planting involves the questions of whole and cut seed, large and small potatoes, and numerous other points which would require too much time for their discussion to be introduced here. We may state, however, that, in our opinion, much of the usual discussion is due to a misunderstanding of the nature and character of the potato. It is not a root, but is a tuber or underground stem, and as such is subject to precisely the same rules as govern the branches of our trees and plants growing

above ground; if budding in the whole branch will make a more vigorous tree, then it is safe to infer that whole seed will make the best and most profitable potatoes; if budding in several eyes, instead of one, is best in the propagation of trees, then more than one eye will be best in cuttings of the potato; the ground is the stock and the cutting the bud; the latter is placed in the former, as the bud is placed in the stock in the nursery, and their functions and relations are alike. In the same manner we may assume that if the bud from a small but well ripened twig will produce as healthy a tree as one from a large one, then small potatoes are as good, if well ripened, as larger ones, and that a cutting from a small and ripe potato will bring as good a hill of potatoes as one from a cutting from the largest tuber in the bin. If the potato was the root or even the seed proper of the potato, then an argument in favor of whole seed and large seed would be just and proper, but, inasmuch as neither assumption is correct, we incline to the view that cuttings are best, and that, other things being equal, those from a medium sized and perfect potato are superior to those from a large and deformed or ill-shapen one.

We admit that the continued use of small potatoes for seed will reduce the crop and increase the percentage of small tubers, but this is not due to the fact that they are small, but because they are not well ripened. If, owing to unfavorable conditions as to moisture and nutriment, the crop is composed of small but well ripened potatoes, no harm will ensue from their use as seed.

After considerable practice and observation, we are satisfied that the best and most profitable crops may be produced by cutting carefully into two eye pieces, and planting one cutting every 13 to 14 inches, in rows three feet apart. Closer planting will increase the percentage of small potatoes and a longer distance will decrease the yield of the crop, and there will be a direct loss in either direction.

The object in view is the production of the largest possible yield of sound and marketable tubers; we may, by close planting, increase the yield in bushels per acre, but we will, at the same time, decrease the number of bushels of marketable potatoes, and the total amount received for the crop.

It is a favorite theory with some that the eye of a potato extends clear through its centre and there joins with a stem running lengthwise of the tuber, and that if any portion of this stem is planted it will grow. This theory is naturally a favorite with the manufacturer of machines intended to cut and plant the seed, or which are intended simply to cut the seed, but anyone who will carefully try planting the interior of a potato, after the eye and a portion of the substance of the potato has been removed, will soon get this theory out of his head; the experiment is easily tried and costs but a trifle.

Under favorable circumstances, and with plenty of moisture and readily available plant food, potatoes may be produced from parings in which the eyes have been carefully preserved, but inasmuch as the cutting must furnish food for the growing plant until its top gets above the surface of the soil and is able to carry on the necessary chemical changes which are absolutely necessary to render plant food available for the plant, it is safest to provide the food in the cutting, against all possible contingencies. During peculiar seasons, it is true that many of the cuttings are found at digging time in very much the same condition in which they were planted, but this

is the exception and not the rule, as the cutting will usually be found to have been exhausted in furnishing food for the young plant until it was able, by its complete formation, to forage for itself.

In answer to the question as to whether the cuttings should be planted in squares or in drills, and if the latter, at what distance apart, Prof. Sanborn gives us the following tables as the result of a series of carefully conducted experiments:

SERIES 1.					SERIES 3.				
Width of Row, 3½ feet.					Width of Row, 2½ feet.				
No. of plat.	Distance of hills.	Table potatoes, yield per acre.	Small potatoes, yield per acre.	Total yield.	No. of plat.	Distance of hills.	Table potatoes, yield per acre.	Small potatoes, yield per acre.	Total yield.
209	24	239.3	19.3	258.6	256	24	163.7	20.4	184.1
261	20	183.3	21.6	204.9	255	20	140.0	34.6	174.6
260	16	233.3	28.0	211.3	254	16	172.6	36.6	209.2
259	12	230.4	31.3	261.7	253	12	166.8	35.6	202.4
258	8	199.3	28.4	226.7	252	8	146.9	54.0	200.9
257	4	144.0	12.7	156.7	251	4	131.5	16.5	148.2
298	12	250.5	32.7	293.2	.....	.....	.....	.....	.....

SERIES 4.					SERIES 5.				
Width of Row, 2 feet.					Planting in Squares.				
No. of plat.	Distance of hills.	Table potatoes, yield per acre.	Small potatoes, yield per acre.	Total yield.	No. of plat.	Distance of squares.	Table potatoes, yield per acre.	Small potatoes, yield per acre.	Total yield.
250	24	117.4	19.3	136.7	292	40	118.0	17.7	135.7
248	20	81.3	26.4	107.7	293	36	218.8	18.2	237.0
247	16	83.5	36.4	119.9	294	32	214.1	20.2	234.3
246	12	78.0	53.8	121.8	295	28	195.4	34.6	230.0
245	8	91.2	48.4	129.6	296	24	231.0	35.1	266.1
244	4	57.7	23.7	81.4	297	20	199.9	41.1	242.0

Some recommend rolling the cuttings in plaster before planting; our own experience in this line so closely agrees with that of Mr. Terry that we quote him, as follows:

"It has generally been recommended to cut some time before planting, and roll the pieces in plaster, and perhaps dry them. I have invariably had the best results from planting fresh cut sets and covering them as fast as they are dropped. In this way I have had acres on which one could not find a single hill missing. When the sets were

rolled in plaster and dried I never had a perfect stand. I have never tried this plan, however, except in experimental plots. We sometimes cut one day beforehand, and keep the sets from the sun and wind so they will not dry any, but prefer to have the cutting and planting done the same day. In this way we have never failed of a good stand, if the provision before alluded to was taken to roll the patch if it was very dry."

MANNER OF PLANTING.

Many recommend the use of planters which drop and cover the seed which has previously been cut by hand. Our friend Terry belongs to this class and does not advocate the use of a cutting machine. Other practical growers recommend them, however. Our own practice has been with too limited areas to render their use profitable, and such as would hardly warrant the use of any kind of a planter.

Having the ground mellow and not marked out too far in advance of the planting, the cuttings will remain very near where they are dropped, and a skillful man will leave them in very nice condition for covering, which may be done with a light harrow drawn either diagonally or lengthwise of the rows; this work is much facilitated where a shovel plow, throwing the furrow on both sides, has been used for marking out the furrows. Care should be taken not to place much earth on top of the cuttings, and if the furrows are but half filled by the first harrowing it is all the better, as all that is required is enough earth on top of the sets to ensure growth and prevent drying and injury from the sun.

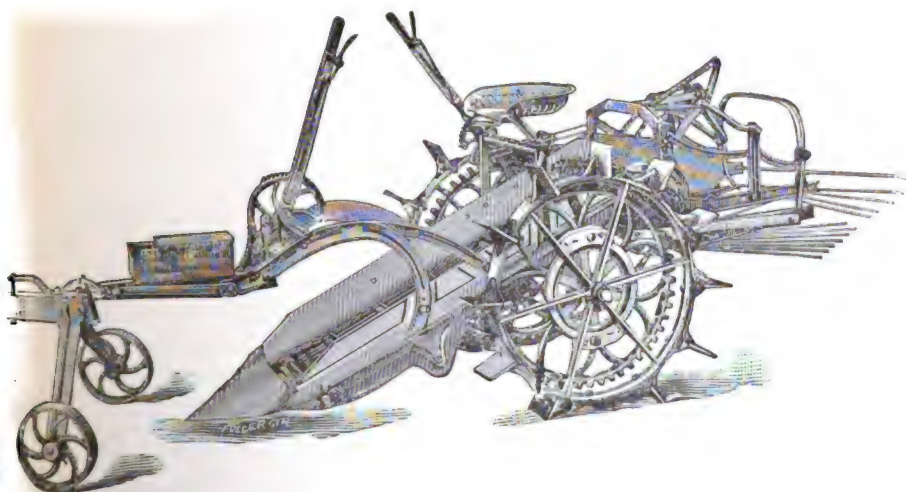
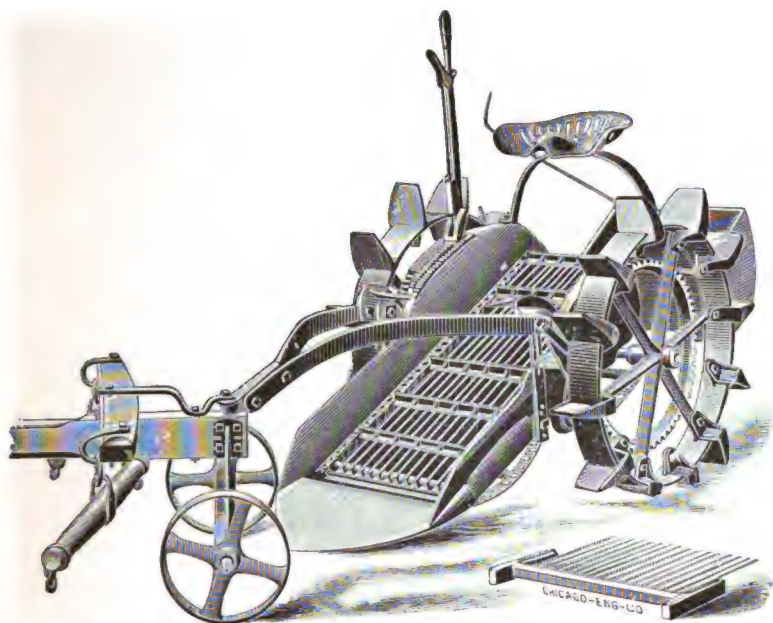
At short intervals after planting, when the condition of the soil will permit, the patch should be harrowed so as to kill all weeds and gradually draw the earth into the furrows and over the sets as they grow upward. Under this kind of culture the soil will be free of weeds from planting time until the vines are large enough for the use of the one-horse cultivator, and are then, with proper cultivation, safe from weeds.

Mr. Terry, in his addresses before our farmers' institutes, advocates the use of a light spike or smoothing harrow even until the plants are several inches in height; our own experience, however, favors the use of a reasonably heavy smoothing harrow until the vines are one or two inches high, and after that the use of a one-horse corn or light spike harrow.

Our best authorities agree that deep cultivation after the plants have attained considerable growth, is disadvantageous, and carefully conducted experiments clearly prove that deep culture, especially after the vines are in bloom, injures the crop.

A light spike harrow, with round steel teeth, is an excellent implement in the potato patch for breaking the crust that forms after a rain and for killing weeds on a hot and sunny day, the object being mainly to keep the soil loose and open on the surface, the former operations having, if properly conducted, killed all the weeds.

At our Connellsville institute, Mr. Terry surprised some present by the statement that he wished that some other kind of bug, worse than the potato beetle, would come around to eat the potato plants. His explanation was that by his successful fight with the Colorado potato beetle he raised fine crops, while those of his neighbors were all eaten up; and his view of the matter was that if another bug attacked the



POTATO DIGGERS.

potato, it would only give him a still better chance to obtain a crop when prices would necessarily be high and profits correspondingly large.

After trying several machines for applying poisons, Mr. Terry writes as follows:

"But still, I can handpick the bugs at less cost, even if I hired men to do it, which is not necessary, as children can do it just as well. Large growers (and Mr. Terry raises 35 acres), who use poison where the bugs are abundant, tell me that it costs them about \$5.00 per acre for poison and labor to keep the crop clean. It cost me more than that the last year that I used Paris green. I have kept my crop quite clean from beetles and larva for the last two years for about half that sum, by handwork. The job was mostly done by children, who were paid about one-half a man's wages. The men helped some at odd spells and would usually get more bugs than the children, particularly when they were gathering the larva. I think that it is seven years (1885) since we used any poison, so we have had considerable experience at handwork."

When writing upon this topic, Mr. Terry drops the following pointers in relation to the employment of children, which will not be out of place even in an article on potato growing:

"I paid my children about \$45.00 in cash for picking bugs last season, and I know that it was good for them, and me, too. But do not forget to pay the little ones just as you agree to do. The meanest man on earth is the one who hires children and does not pay them just as promptly as he would anyone else, or who gives them a calf to raise and sells it when it is grown and pockets the money. That is the way to make them disgusted with farming."

DIGGING AND HANDLING THE CROP.

Growers have diverse views upon the question of digging and of the comparative cost of digging by hand and by machinery. Mr. Terry, in his picture of "The boss, unpatented potato digger," shows us a stout man with a potato fork, and the likeness is suspiciously close to that of the proprietor as he might have appeared five or six years ago.

Of the operation of this digger, Mr. Terry (several years ago), writes thus: "It seems to me that, with over 500 diggers patented, we have not yet, so far as I know, a perfect one. I have tried one of the best, the price of which was \$125. The manufacturer was here in person, and every possible effort was made to make it work, but it has gone back. I know it does work satisfactorily under some conditions, for parties using it have written me so. On level prairie, or other light soil, with potatoes hilled, I should think it would do fair work. With us it left too many tubers covered up. We dug the ground over with a fork and found some eight or ten bushels per acre. This, at the lowest price we ever sold the crop for, would pay for hand digging. But we shall soon have a perfect digger; it will only be a matter of time; meanwhile, if we keep our fields clean, it will not cost much to dig by hand. It cost me just one cent a bushel to dig my crop by hand in 1883. This may be hard for some to believe, but it is a fact. One man dug all but a very few. He had worked for me some five years and was an expert in that line. One week he dug from 180 to 190 bushels per day for six days. His best day's work, in nine hours

he had to stop before night to cover up the piles, as I was absent), taking the potatoes right through the field just as they came, was 223 bushels."

Making all due allowances for the superiority of Mr. Terry's men, and they were fully 25 per cent. better than any we ever had, there is still something in favor of hand digging, over the use of any machine, especially constructed for that purpose, that we have ever seen; but the best work that we have ever done was by the use of an old fashioned "shovel" or bull-nosed plow, drawn by a pair of steady horses; once to throw out the potatoes and once after they were picked, to uncover any that may have been covered or missed the first time; it gave us good results, and the subsequent plowing, harrowing and seeding to wheat failed to show that any considerable amount had been missed by the plow or pickers.

Much of the profit of the crop depends upon the mode of handling and marketing, and, like many other crops, we must now make our profit out of items which we used to think were too small to be taken into consideration. Thus far, for picking we have seen nothing better nor more convenient than the boxes used and recommended by Mr. Terry at several of our farmers' institutes; they are made 13 inches square and 16 inches long, inside measure; the sides and bottoms are of boards three-eighths of an inch thick, and the ends five-eighths of an inch in thickness. Any light wood will do, and Mr. Terry states that they cost from \$25 to \$30 per hundred at the factory; they should weigh but six to seven pounds, and the potatoes, being picked right into them, are protected by covers, cut 15 by 16 inches. Each boxful may be counted as a bushel, and will hold out by weight if the potatoes are good.

If to be delivered to the customer or hauled to the railroad, they can be taken in the boxes and either emptied in the customer's bin, or the railroad car, without bruising. Where large areas are to be dug, they will enable you to handle the crop much more easily, without bruising or breaking the skins, than where they have to be handled two or three times before they leave the producer.

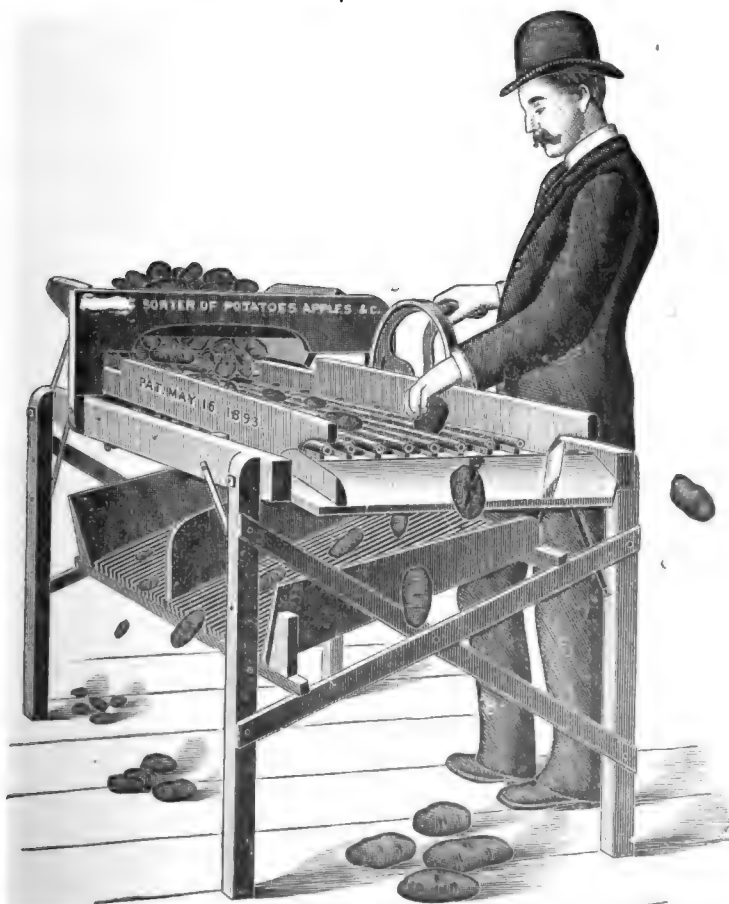
If the potatoes are to be stored over winter, the filled boxes may be stored on the barn floor until there is danger from frost, and then be taken to the cellar without further handling, and may remain all winter in the boxes without being sorted; but care should be taken not to pack the boxes too closely in a damp cellar or the wood will decay and loss ensue.

In wet weather, the covered boxes are safe in the field against any ordinary shower which would otherwise have interfered with the work. Even when they are not to be taken out of the field in the boxes, they can be so readily emptied into the wagon that the boxes will be found much more convenient than baskets.

When the loss from shrinkage, handling, frost, decay, rats, and the other many causes which operate to decrease the value, weight and quality of the crop, between digging time and the next spring, are taken into consideration, we think that it will be found that it usually pays to market the crop, right out of the field, and let some other person take the risk of the rise in prices to balance those chances of loss and deterioration. But this will not, of course, apply to the farmer who, from his location, is able to deliver the potatoes, as wanted, direct to his customers.



1



2.

POTATO SORTERS

The loss by shrinkage will depend in great measure upon the temperature of the cellar in which they are kept; if its temperature can be controlled and kept just above freezing, the loss will be very small, and will be reduced to a minimum; but if, on the other hand, it is too warm, and induces sprouting, there may be a loss of any amount, up to 15 per cent. The danger from frost is less, where boxes are used, and the temperature may readily be controlled by a coal oil stove, which will cost but little, and which, even in very cold weather, will place the matter under the control of those in charge.

CONCLUSIONS.

1. Prepare the ground thoroughly and remember that work done before planting is much cheaper and economical than after the crop has been put into the ground. One harrowing before planting is often better than two later in the season.

2. Use yard manure as far as possible in advance of planting, so that it may become well decomposed. If commercial fertilizers are used, apply them in the rows, close to the cuttings.

3. Cut the potatoes carefully to two-eye pieces and discard the bunch of eyes at the blossom end; they cannot be divided so as to give but two eyes to the piece, and by discarding them we need lose but a very small part of the potato.

4. Plant in rows three feet apart, and the cuttings about 13 inches apart in the row. Drop by hand, unless the size of the plot will warrant the price of a dropping machine, and even then we would give the machine considerable odds as against the more certain hand dropping.

5. Harrow and cultivate well and thoroughly whenever the condition of the soil will permit. Cultivate lightly, and not too deeply, for deep culture, after the tops and roots are well formed, will injure the crop.

6. Unless you have a large area in with the crop, dig with the shovel plow or by hand; a digger will cost not less than \$100; this means an annual interest charge of not less than six dollars, and at least four more for wear and tear. Ten dollars will dig a good many potatoes by hand, or with the shovel plow.

7. If you have to ship to a distant market, it usually pays best to ship out of the field, though with the boxes used by Mr. Terry, the cost of handling is reduced to a minimum.

8. Make your calculations that the crop may cost you anywhere from 25 to 35 cents per bushel in the field, and sell accordingly. You may also calculate that with ordinary treatment they will lose not less than 10 per cent. by keeping until shipping time next spring.

9. If you decide to go into potato growing, make up your minds to make them a regular crop, and do not get discouraged because the price may fall to a low point some years; these are the potato grower's opportunity, and to carry on the business right the same areas should be planted each year, without regard to price; it is the average which will tell, and not the prices of any one season.

10. Make up your minds that some years, as is the case with all crops, the margin between cost and market value will be very narrow, but you may depend upon it that the next season will rectify this and make the balance even.

11. Remember that with "head-work" and modern appliances, the work has been greatly reduced, and that we may now make a profit upon a margin which would have been ruinous 20 years ago. In fact, it has been claimed by some, that a potato crop of 200 bushels per acre may be handled and marketed with as little outlay as one of corn.

SHEEP RAISING FOR PROFIT.

BY JAMES McCracken, Jr., *Member from Jefferson, Frostburg, Pa.*

(Read at Clarion Institute.)

In discussing any subject of this nature, it is always well to define location and surroundings, so that the writer may be properly understood. I am located in the southern part of Jefferson county, about 75 miles west of the centre of the State, and what I may say on this question may be considered more particularly applicable to my own and surrounding counties.

Generally speaking, this section of our State is rolling to hilly. Our soil, as to its original fertility, was various—poor, medium, and fairly good. The formation is likewise interchangeable—clay, loam, sand, gravel and stone—each forming part of the patchwork of our county's surface. Most of the farms are supplied with needed water and shade trees. The system of farming in this section, during the last 75 years, has, however, reduced many of our farms to a plane far below their primitive power of production. Hence, we find our agricultural interests in a depleted condition, many, yes, very many, farms yielding unremunerative crops, and their owners in debt, dissatisfied and discouraged.

Notwithstanding the glowing reports of the rapidly increasing wealth of the country, the fact remains, only too glaring, that a majority, at least of the farmers in this part of the great "Keystone State," are not in enviable circumstances. Is it because we have not had time and opportunity for developments? No. Is it because we have been repeatedly visited by unfavorable seasons or discriminating circumstances? Is it because our people have been unthrifty and slow, unwilling to work, and extravagant in their style of living? No. Is it because our climatic conditions are such that our farms must necessarily become poor and remain so? No. Is it because our farmers would rather remain in debt upon poor farms than otherwise? No. Is it because the system of farming practiced by ourselves and our fathers, for generations past, has gradually exhausted the supply of plant food placed in our soils by the wise hand of nature during the hundreds of years of the forest age which preceded the march of civilization and Pennsylvania agriculture? Verily, friends, I believe we have struck the key note of our disappointment and unsatisfactory surroundings. Turn on the light of the sunset of the nineteenth century, and see if there is not something in nature, in progress, or in science, that will stay this tide of depletion, turn the farmer's face toward victory, and replenish our worn-out fields with the ammonia,

phosphoric acid and potash that our crops have been pumping from the soil for generations unnumbered.

Whilst every other business is making rapid strides toward success and prosperity, must Pennsylvania agriculture lie in the old grooves of a half century ago? Or shall we try to undo the malpractices of the past, and, with an enlightened agriculture, backed by the ability and enterprise of enlightened men, place our occupation where it justly belongs—in the front rank of the great industries of the greatest State in the world? Oh, farmers, who complain of hard times, hard prices, hard work, hard luck, and hard business, stop long enough to consider for yourselves the subject of my essay, "Sheep Raising for Profit."

I am not here to advocate the sheep business as a panacea for all diseases found upon the farm. It will not cure the chicken pox or mumps, but it will cure, to a large extent, the worst disease the Pennsylvania farmer has ever had to contend with—that of soil exhaustion. I know it is claimed by some that sheep will "eat the life and heart out of a farm." Perhaps they would if they had nothing else to eat; and I know of some farms that are too thin to founder a flock of sheep if they were to eat the whole farm, owner and all.

The sheep business, the same as any other business, will succeed, or otherwise, just in proportion to the amount of skill applied. Some men would never make sheepmen. Some men would never make anything unless it would be a noise. But we are here to consider this subject in the light of the average farmer, and let the business rise or fall upon its own merits. To consider in detail the raising, feeding and handling of sheep would be impossible in this paper, for volumes have been written on the subject, and the half has never been told.

As to what breed of sheep to start with, that has nothing to do with the case. Success depends upon the man, and not upon the sheep. I have known men to make signal failures, after having a splendid lot of high-priced thoroughbred sheep to start with. Other men have succeeded admirably when starting with a most inferior flock foundation. In my early sheep experience, many years ago, I bought a ram for \$40. The sheep was all right. The man who sold him was all right, and I was all right. The only thing about the matter was that the transaction was about 15 years in advance of my knowledge of the sheep industry. A \$40 sheep was as much out of place in my hands as would be a diamond ring in a sow's nose. But mistakes are good, safe stepping stones upon which to walk, as men seldom knock their brains out but once against the same stump.

In the sheep business there are three harvests a year—lambs, wool and mutton. The profits in the lamb harvest depend very much upon whether the lamb is allowed to chill and die before it is an hour old, or whether it tips the beam at 90 pounds, five or six months later in the season. The wool profit is measured by the weight and quality of the fleece and the effects of the McKinley bill. The mutton profit depends largely upon whether a dollar's worth of mutton has cost you 80 cents or \$1.25.

Either of the above conditions may be true, and the fact that they are sometimes true accounts for the diversified opinions on the question of sheep for profit. The prime object of this paper, however, is to consider the general principles which underlie the sheep indus-

try as a business, leaving the discussion of the many breeds, modes and practices to the pleasure of others. Detail in the sheep business, like dehorning in the cattle business, is a subject of wide and prolonged debate, and the various opinions presented are as numerous as the stars in the heavens.

Maintaining and increasing the fertility of the soil is the formation of my theory. That this can be done has been proven many times, and in many places. I was shown fields in Washington county, this State, which had been stocked with sheep for one hundred years. The condition of those fields is to be envied by every land owner in Pennsylvania.

The argument that sheep will eat large quantities of feed is overcome by the fact that feed will grow upon the farm where it is consumed. Sheep will eat any grass, grain, hay or straw that is fit to feed to any other stock; besides, they will strip the leaves and seed pods from almost every known variety of noxious weeds, plants and briars. These pests must wane and die beneath the incessant cropping by the flock. Again, seeds will never grow after having passed through the digestive machinery of a sheep.

There is something in the sheep's appetite which craves something bitter, coarse, and uncommon; hence, he is always looking for some weed or sprout which benefits the farmer when destroyed. In this way, much vegetable growth is turned into effect by the sheep that would be left untouched by all other animals upon the farm.

The manure made upon the farm is the basis upon which every intelligent farmer builds his plans, and by which fertility may be maintained. This idea implies the keeping of animals to the extent of the farm's capacity. The question then arises, to what class of animals can we feed our crops so as to derive the greatest possible benefit from the food consumed and have the greatest manurial value to return to the soil? Basing calculations upon present prices of horses, beef and mutton, the verdict certainly must be in favor of the sheep, so far as market value is concerned, and I assert, without fear of contradiction, that any given quantity of grass, grain, hay, or straw, will produce more clear profit, if intelligently fed to strong, healthy sheep, than if fed to any other class of domestic animals.

The manure resulting from sheep feeding is of as much or more value than that resulting from the same amount of feed consumed by any other stock. It is stated by chemists that the daily excrements of a sheep are worth one and one-half cents, using the commercial value of the plant-producing elements contained therein as the standard of computation. Allowing this to be true, the man who is keeping 100 sheep upon his farm is adding to the fertility of his farm at the rate of \$1.50 per day, or \$547.50 per year. When the sheep are in the field, the manure is left more evenly distributed and in more available form to be drenched into the soil by every shower than is the manure of either horses or cattle.

When the sheep are in the barn, the manure is where it can be had when it is wanted. If the sheep are fed in a barnyard, by the roadside, or in a wood lot, where the manure is not needed, or where nine-tenths of it will be washed away or never gathered up by the farmer, that is the fault of the head which directs the business, and not the fault of the sheep nor of the manure.

I admit sheep must not be kept in the field during inclement

weather; nor will it do to keep them in damp or poorly ventilated stables; but, "where there is a will, there is a way," and in these days of narrow margins, no business will admit of such a waste as allowing manure to be washed away or lost for lack of proper care or management. Such arguments may look reasonable upon paper or sound logic from the platform, but we all know that theory is as worthless as a rope of sand, unless it is backed by capital, brains and experience; and, as evidence that I have faith in the subject of my essay, having spent several years of the best of my life in learning a part of the unwritten work of the business, and having to some extent met with both success and failure, I have built a barn with a feeding capacity of 100 sheep, trying to keep in view the essential characteristics, to-wit: Thorough ventilation, health and comfort of the sheep, convenience in feeding and handling of the flock, economy of feed, and the accumulating and saving of the greatest possible amount of manure.

The site selected is high land. Thorough drainage has procured good foundation, dry stables and surrounding ground, and plenty of water for the stock. The building is 34 by 44 feet, and 22 feet high above the stone wall. This gives good, high ceiling below, and a hay loft 14 feet deep. There are two doors, each 9 feet wide, in each end, thus forming two driveways lengthwise of the building. The interior is divided into four rooms, each being 17 by 22 feet.

As the barn stands in the corner of four fields, each pen opens into a field separate from the others.

The sheep are graded and each grade kept by themselves, and they will be, either in the barn or out on the sod. In either case there will be no loss of manure. The feeding is done by throwing the hay from the top of the mow directly into the racks all around the walls. The open spaces thus formed on the sides of the building, aid materially in ventilation, as heated air immediately rises and passes away through the top of the barn. The water is arranged in troughs in the centre of the barn.

Each of the four nine-foot shed doors is made in four sections, either or all of which may be left open or closed at pleasure. In this way I can control the draft and ventilation with as much ease as turning the damper of a heating stove. In case of approaching rain, I can call 100 sheep from four different fields into their respective stables and close the doors in less than five minutes' time.

I have demonstrated to the entire satisfaction of myself and all who have inspected my barn, that I can stable, feed, water and otherwise care for 100 sheep with the minimum expense of time, labor, worry and profanity.

AGRICULTURE IN THE PUBLIC SCHOOLS.

BY PROF. S. B. HEIGES, *Small Fruit Culturist of the Board, York, Pa.*

(From an address at the Kittanning meeting.)

I will preface my remarks with the statement that I have been connected with the public school system of Pennsylvania since I left it

as a pupil, for upwards of forty years, as a teacher, county superintendent of one of the largest counties of the State, having had 350 schools under my charge for six years; also as school director, when I visited the schools once a month, and have been principal of one of the Normal schools of this Commonwealth; and I think the gentleman who has advanced his views on one side of this question, from his knowledge of psychology or mental philosophy, will admit that it is a matter of little difference what he selects for human development. There are different faculties that belong to the human mind, such as perception, memory, reflection, judgment, reason, etc., and there are other subjects which would have developed these faculties just as readily and thoroughly; but for practical study and everyday use, the branches have been enumerated in our school law such as they are. I believe there stands nowhere in Pennsylvania a firmer friend of the common school system than your humble servant, and I say, teach what you can of the sciences in your public schools; but I would not advocate the introduction of all the sciences in the public schools of Pennsylvania. If you have visited schools and observed the work as I have, you will find that a great deal of time is wasted in what is not educational. To illustrate: I have heard "the" called in some of our grammars an article and others a definitive adjective. I have heard the boys and girls parse over thousands and thousands of times, "The deeper the well the cooler the water." There you have the THE occurring twice with a different signification. And when this has been thoroughly learned, the time consumed in parsing that word is wasted. The same is true of hundreds of other words.

A great deal of geography is useless, entirely useless. The learning of all the little insignificant rivers of Africa or of Australia, that were never navigable and of no commercial importance whatever, is entirely useless and therefore not educational; and the location of every mountain, cape, etc., of South America and other portions of the world, is not useful knowledge at all. The location of all the groups of islands from which we receive no products, nor to which we send any, is of no beneficial account and I do not consider it knowledge. It does not develop any of the faculties of the mind; it is a mere repetition, mere threshing of straw. If your schools are as I believe they are in this county, (I have never visited one but I judge from the intelligence of this audience), if they are as I think they are, you will find in almost every school throughout this county some five, six or seven pupils who are monopolizing one-half the time of the teacher every day. Boys and girls who, by the authority of the law, can go to school until they are twenty-one years of age, and I am sorry that many who are wasting their time do not go until they are that old, but those who are going are pursuing such studies as algebra, geometry and physiology. They are there by right, because there is no limitation as to what shall be taught in our public schools, if the teacher has been examined upon these branches and has a certificate. This is the state of affairs, and I believe it to be here in Armstrong county the same as it is in York county. I believe you are progressive people; I believe since the incorporation of our common school system in the year 1834 down to the present time, that there are some of our pupils every year receiving instruction of this kind, and that the younger pupils are being neglected from the simple fact that the time is being consumed in the instruction of these advanced pupils. They get

about half an hour to algebra, about half an hour to natural philosophy, about half an hour to geometry—in fact they get about one-half of the time of the common schools, and a great majority of the other members of the school will have the remaining three hours. Now, gentlemen, I stand here as a friend of the little boys and little girls and want them to receive better instruction than they are receiving. This can be done by taking out these larger boys and larger girls in your township, and putting them in a central school and having them taught there. I have been honored by being called into various counties of this Commonwealth by the State Board of Agriculture, and have gone a great many times with the Honorable Secretary of this Board to attend meetings, and we have been put to answering such questions as our children should be taught to be able to answer in the public schools. I abominate the use of text books in the teaching of any science; they are the crutches with which lame ducks walk. Your wheat is threshed at the rate of two and a half cents a bushel and your horses are eating their heads off in the winter months, and you say there is no profit connected with wheat raising. Have connected with your school, places where these horses can be protected and have your son hitch one of these horses to a wagon, and go there and take his brother and sister along, and as they pass by the humble blacksmith and day laborer who have a son or a daughter, let them also be taken to this school.

Now I wish I had the time this morning to give you a talk on the grand advancement which has been made in this system, known as the public school system of Pennsylvania, and I think brothers Kistler and Lawson, who have antagonized the introduction of some of these studies into our public schools, would not have a complaint of this kind. God hasten the day that our boys and girls will be taught these things. They leave the farm because there is not pointed out to them, the matters of interest that relate to the science of agriculture. I don't say the science of agriculture; it has not reached the dignity of the science of agriculture, and yet is the oldest of all the callings. I will modify it by calling it science in agriculture—such things that should be taught and can be taught in our public schools without any additional expense. Some one has said that our teachers are not qualified to give instructions of this kind. I admit this. However, we have all over our State an expensive and most valuable system of Normal schools. Let them have a chair of agriculture in these schools and qualify teachers for these departments in sufficient numbers to meet the demand; and, ladies and gentlemen, if this plan were adopted, there would be such an advance, not only in our common school system, but such an advance among us that we could discuss subjects of a higher plane than we are here discussing.

I would have astronomy taught by means of the blackboard. I would point out the various phases of the moon, the influence of the moon upon the tides, etc. Teach this practically. One of the greatest scientists says, "It appears I have walked along the shore of the great ocean of truth and had only here and there picked up a little pebble." Isaac Newton said, "Is it not time that our sons and daughters should be taught something of these grand laws of nature?" Perhaps the science of astronomy relates to the subject of agriculture less than any other, but it teaches the change of seasons, cause and

time of high tide at Philadelphia and high tide at New York—all those things which relate to commerce. Astronomy has something to do with the knowledge of what the farmer should possess. I said some weeks ago that I believed I could pass down the entire English alphabet and take all of the letters and have them begin a science. Some one said he would like to know how I would get along with Q and X. To Q I would apply the science of questioning, and to X I would apply the science of exaction or exactness.

Botany—How much has that to do with your pursuit? How many of you know the habits of the weeds that inhabit your soil and choke out your crops? How many can tell which is an annual, biennial and perennial? These terms are much more important to know than learning of these insignificant terms in geography. How many are familiar with the two departments of botanical life? (I shall use no scientific terms). The flowering plants and the non-flowering plants, know the means by which they propagate themselves and reproduce themselves. In the study of this subject you will also gain a knowledge of those mysterious fungi which produce your potato rot and other fungus diseases.

Take the science of chemistry; a great many of the things with which the farmer has to deal depend upon laws that are as strict and immutable as the laws of God. Chemistry; I wish I had the time to tell you the scope of chemistry that pertains to plain, practical farming, not the higher realms of chemistry. Take it in our fermentation: There is not a lady here but knows that if you take three or four potatoes and put them in a pot and boil them, pass them through the colander, using the water in which they were boiled with some flour; in the course of time, if placed in a dark, damp cellar you will have yeast; we call it "sots" in our county, yet few know that the yeast plant, as a fungus, is floating in the atmosphere.

Dermatology—skin diseases that so frequently affect your domestic animals and your poultry. I don't know that but one gentleman came a great distance to ask one question on dermatology. It was a gentleman who asked me a single question at the hotel. What I told him could have been taught in every public school.

Entomology—a knowledge of insect life. I have known persons who have tried to destroy insects by insecticides and have failed. The two classes of insects are those which have gnawing jaws and those that are called suctorial insects. There is no use to apply common insecticides upon the latter class of beetles, but it is possible for you to destroy every class of insects by insecticides. We don't want any expensive apparatus to gather these things, and investigate them in the public schools and discover the various stages through which they pass. Let me take the Colorado beetle, that at one time has a perfect lemon-colored egg and in a few days more passes into an orange-yellow egg and then in a few days comes out in the shape of a slug. At which stage of its life must we attack it in order to destroy it?

Finance—would you have that taught in the public schools? Certainly I would; I would have the farmers understand this subject intelligently and I would have you understand it in the broadest sense. You would like to know which one of your senators is going to vote right on repealing the purchasing clause of the Sherman silver bill, and which one is going to vote wrong. It is not politics; it is not partisan politics; it is political economy which every farmer ought

to understand, and he would not be misled by tricksters and politicians who deceive the people as to the true causes of the present depression.

Geology—from what sources soils come, and whether they were formed through the agencies of heat or cold and transported to the other portions of the earth. I would have that taught practically—not from the text books. I have said and stand here and repeat the declaration again, and I will stand by it—that if I had the money that is uselessly and ignorantly expended for commercial fertilizers in Pennsylvania, by farmers applying to their soils that which their soils do not need, that this amount not only would establish these schools in every county of the State, but pay their teachers also. There are persons who are using potash when their soils contain an abundance of it. There are persons using nitrogen when their soil has an abundance of it. I would use the field adjoining the school house as an object lesson.

Zoology—the science by which you can investigate the forms of domestic animals and wild animals that prey upon your flocks, because the dog is nothing more in law than the order of a wild animal, unless he is registered.

I thank you for the attention you have given me. I believe those gentlemen who advocated that our public schools ought to be let alone, will agree with me that there can be a plan adopted by which our public schools may be much improved—by taking out the pupils who are monopolizing much of the time of the teacher and having them put in a central school house, not only in Armstrong county, but in every county in this grand old Commonwealth of Pennsylvania, and thus devote more time to the younger pupils.

REQUISITES OF A COUNTRY HOME.

By MRS. ELIZA R. WHITSON, *Atglen, Pa*

(Read at Christiana Institute.)

A few days since when the thought of this belated essay, which, in a moment of weakness, I had promised to prepare for this meeting, was beginning to weigh somewhat heavily upon my mind, the words of Scripture came to my remembrance, "In a multitude of counsellors there is wisdom."

"I will avail myself of this promised help," thought I, and turning to the friend nearest to me, I propounded the query: "What is the chief requisite of a country home?"

Quick came the answer, "Money." I put that down, and turning to another, in whose judgment I have much confidence, said, "And what thinkest thou?"

"Well," after a moment's reflection, "a good wife."

This pleased me, of course, and I answered, "But the good wife, unless supplemented by the good husband, loses half her strength. I will put them down together, the good wife and the good husband."

Believing in the luck which is said to belong to odd numbers, I asked a third one, "What is the chief requisite of a country home?" "A good girl," was the prompt reply. I put that down too, and as I went hither and thither about my work, I occasionally turned over in my mind the heads of my discourse.

The money I could make nothing of. Full well do I know that a certain amount of it is a necessity. I know too, that farmers and their wives, as a rule, work hard enough to have much more of it than they have; but I have attended enough farmer's institutes to know that our good husbands and brothers will not allow this occasion to pass without ventilating this subject well, and, therefore, I will not presume.

The Grange, the Alliance and what not, are on the war path for better times and fuller purses for the farmer; and may they be so successful that there will be plenty to go all 'round, and that soon.

The good wife and good husband. They are the makers and builders of every home, in city or country, and however much they may fail in a worldly point, and however much their surroundings may invite criticism, still their home, built upon the foundation of a strong and abiding love, has an influence which none may reckon.

Happy the home and blessed the children, who from earliest infancy breathe its loving, cheerful, Christian atmosphere!

"The good girl." Like the good wife, she is beyond price. How to get her, how to keep her, I cannot tell. If I could, gladly would I reveal the secret to my suffering sisters. Every year the situation grows worse. All the passably good girls go to the city, lured by the liberal wages which we cannot afford to pay.

Speed the glad money-tide, brothers, when we can offer such compensation as will give to the over-taxed farmer's wife, a neat and capable assistant.

And now, I have done with my three heads, kindly given me by my counsellors, and have not yet said what I wish to. So I will make a few suggestions, as they present themselves to my mind.

The ideal country home, as it stands out in my imagination, is well set back from the public highway. It gives an air of elegance and refinement to a home, and makes very modest buildings look much better than when they are built close to the public road, to say nothing of the freedom from dust and noise of travel.

The buildings should be somewhat elevated, that good drainage may more easily be secured; but not on too high ground would I build my home, for this makes toilsome work for both man and beast, and we who earn our bread by the sweat of our brow, should be careful in our planning to avoid unnecessary labor. For myself, I love a southern exposure. Indeed, so fond am I of the sunshine, that I have sometimes thought I should like a house built upon a turn-table, that it might be shifted around, particularly on cold and wintry days, to get the full benefit of the warmth and brightness. And while I love sunshine, I also love shade, and would have my lawn dotted, but not too thickly, with beautiful trees, far enough from the house to allow the sun, that greatest and cheapest preventive of sickness, to keep all sweet, and pure, and dry.

The barn and outbuildings should be well set back. I have often seen a charming view quite cut off from having a barn or wagon shed placed in front of the house.

The country home should be planned with direct reference to the means and comfort of the family. Farmers are only mortal, and are not all proof against the ambition to have as fine a house as their neighbor, and what are styled modern conveniences are oft times sad inconveniences. For example, very high ceilings make long and wearisome trips up and down stairs. Ample houses and large rooms are certainly pleasant if one has the means to afford them, and can have a retinue of servants to help keep them in order; but a big house and one weary woman to keep watch and guard over it all, is a doubtful comfort. Better the old time kitchens of our childhood, where the cooking, eating and sewing were all done, and where there was always a cosy carpeted corner, with an easy chair, for father and mother and the friendly neighbor. Ah! I have some tender, treasured memories of happy hours spent in just such a dear, old kitchen. I see again father's and mother's cheerful, loving faces, and my heart thrills with warm feelings of gratitude to them for the pure, simple home life, and the beautiful sermons of right living which every day of their lives preached.

One thing that contributes largely to the health and comfort of the inmates of the country home is a large garden, or more properly, truck patch, with abundance of small fruits and vegetables. I know farmers who scarcely ever have any vegetables except potatoes and cabbage. Something always happens to their garden. Either the seeds did not come up, or the pigs or cows got in. The trouble is, they don't plant enough, and they don't take care of them after they are planted.

It is so easy to have a succession of summer vegetables. Dear old Mother Earth loves to give good things to her children, and if we but commit the seeds to her keeping, and give them the kindly care necessary to insure growth with any crop, we can set before our dear ones, healthy, delicious food, such as our city brethren know not of. And small fruits; I wonder how many of the farmers whose families are represented here to-day, raised, last summer, as many strawberries as they and their families could eat, with abundance to can and preserve for winter. And yet, strawberries are just as easily raised as potatoes. And raspberries and blackberries—the farmer should have all these in abundance. Every man, who has control of land, should see to it that he and his family have all that they want of these healthy and delicious small fruits. If we cannot solve the money problem to our satisfaction, we can, at least, have numberless good and satisfying things in our way, and the farmer who has the prudence and forethought to plant a well-assorted orchard of standard fruits, and put in here and there a grape vine, where the sun can kiss its ripening clusters, will half forget his troubles, as he and his good wife and children revel in the luxuries provided by his kindly forethought.

Neatness about farm buildings is another very important thing. How often in passing along the road we see such evidence of neglect; great patches of weeds, whole fields, sometimes, allowed to grow and go to seed; gates off the hinges, and farm machinery scattered about or left where last used.

A small house and small grounds neatly kept, are certainly much more satisfying than ample ones neglected.

Some very small homes are perfect pictures of rural beauty, and I have sometimes felt, when passing such an one, that here, with a very

modest income, one might lead an almost ideal life. A house so small that house cleaning would be a trouble of short duration, grounds that could be kept in perfect order, and no great array of things that should be done, but for which no time can be found, robbing one's nights of their rest and precluding any thought of leisure.

Books, too; let me not forget them. No home, either in city or country, is what it should be if it entertain not those great, noble souls, who, though dead, still speak to us through their written word. Let us guard, too, carefully, the books which we have in our homes, that no subtle poison be distilled into pure and innocent minds. Surrounded by books, magazines, and a few congenial friends, who need call the farm life dull?

And while trying to number some of the requisites of the country home, let me not forget the good neighbor. And as in the matter of friendship, it is said "he who would have a good friend must be a good friend," so he who would have a good neighbor must be a good neighbor. Social, friendly, kindly; ready to compare experiences and experiments; ready to borrow, if need be, and even a little more ready to lend.

So in sickness and sorrow, as well as in joy and gladness, the magical chain of good fellowship, stretching from one house to another, will cement and perpetuate those beautiful friendships, without which any life is dull and barren indeed.

Just one more little item, and I hope it will sink deep down into the heart of every man here. Every country home should have a good, gentle horse that the women and children can drive. Not an old, worn out, wheezy animal, but a good one that can go. Women's time is too precious to allow them to go poking along behind a worn-out old horse. How often do we hear farmer's wives say, when invited to visit, "Father and the boys are so busy, and we have no horse that I can drive." There is so much real enjoyment to the whole family coming from the possession of a trusty and gentle horse, that every good man should number it among the essentials.

The rides to the mill, to the store, the many errands which mother and the children can do, the picnic party, the social visit to friends and relatives, will all hold their place in the halls of memory, and never cease to awaken grateful thoughts of the good father, who, in whatever horse trade he might be beguiled, never failed to remember that there must be one good horse for mother and the children.

RATIONS FOR DAIRY COWS.

BY THE SECRETARY

Fifteen or twenty years ago our dairymen had no idea of counting the cost and constituent elements of the rations which they were feeding to their cows; they did not realize that there was such a thing as a "well-balanced ration," and that an unbalanced ration was always fed at a loss to the feeder, all elements upon either side in excess of

the requirements of the animal, being practically lost to both the animal and the dairyman.

A few scientific feeders and our experiment stations have accomplished wonders in showing feeders exactly what should be fed, and exactly where and how waste was to be found, and how avoided. Science, through our experiment stations, has clearly proven that our stock feeders in the past have, by feeding such large amounts of rough provender without grain, practically thrown away a large amount of that class of feed, without any gain, either to the animals or to themselves. It has been clearly shown that in many rations the substitution of five cents' worth of grain or meal, would have saved at least ten cents' worth of hay or other dry provender.

The Wisconsin Experiment Station has devoted considerable attention to the matter of feeding dairy cows, and has collected a large amount of data from the most experienced dairymen from the State.

The following rations are taken from the reports of these farmers and dairymen to the station, and by the station assigned their proportion ratios and scientific valuations. How far they are applicable to our own State, we leave for our dairymen to decide.

1. "Sixty cows in herd, Durham and Red Polls, average weight of cows, 1,200 pounds; average yield of milk, 6,000 pounds; of butter, 260 pounds; milk contains from 3.6 to 4 per cent. of fat; cows go dry two months; specialty, butter production.

Ration.—Hay, 5 to 8 pounds; corn silage, 30 pounds; oil meal, 3 pounds; corn, with cob and oats, equal weight, mixed, 10 pounds; cost of ration per day, 17.7 cents; nutritive ratio, 1:6.9."

2. "Twenty-seven cows in herd, grade Jerseys; average weight, 900 pounds; average yield per year, of milk, 5,500 pounds; of butter, 320 pounds; average fat in milk, 5.25 per cent.; most cows go dry 6 to 8 weeks in July and August; a few are persistent milkers, who are not dried up at all; specialty, butter production.

Ration.—Well-eared corn silage, 27 pounds; dry fodder, with some ears on, 8 pounds; clover hay, 6 pounds; what little oat straw they will eat, perhaps 1 or 2 pounds; oil meal, 4 pounds; wheat bran, 4 pounds; in all, each cow was fed about 14 pounds of grain food, as there was about 6 pounds of corn in the silage and fodder. Cost of ration, 14.6 cents; nutritive ratio, 1:8.1."

3. Same herd as preceding; fed after March 1. Ration.—Silage, 40 pounds; dry fodder corn, 4 pounds; wheat bran, 8 pounds; hay and straw as in former ration; cost per day, 12.7 cents; nutritive ratio, 1:7.4.

4. Seventeen cows in herd; 12 Guernseys, 2 Guernsey grades, and 3 Short Horn grades; average weight of cows, 1,050 pounds; annual yield of milk per cow, 6,143 pounds; average per cent. of fat, 5; cows generally go dry about two months, during July and August; specialty, breeding and butter making. Ration.—Corn silage, 40 pounds; clover hay, 5 to 6 pounds; roller bran, 10 pounds; O. P. oil meal, 2 pounds; cost of ration, 15.2 cents; nutritive ratio, 1:5.3.

5. "Fifteen to twenty cows in the herd; registered Holstein Friesians; average weight, 1,200 pounds; milk yield, from 6,000 to 16,000 pounds; average per cent. of fat in milk, 3.5; cows go dry generally during summer months; specialty, breeding, and the production of the most and best quality of milk we can get. Ration.—Silage, 50 pounds; hay, 10 pounds; bran and oats in equal parts, by measure,

10 pounds; oil meal, 2 pounds; cost of ration, 19.4 cents per day. We calculate to feed all the cows will eat and clean up good. The ration given is a good, stiff ration, and a good working ration, and we do not think, on an average, our herd will eat more and eat it clean day after day. Some will eat more and some less, and we had two large cows refuse this ration this winter. Were we to change this ration, would increase the grain fed and lessen the hay, and were we to make it suit ourselves exactly, would reduce the silage and hay a little and add carrots or beets, and increase the grain feed a little; but it is hard, back-aching work to grow roots. A manager of a dairy herd must know his cows, know what they can stand and do good work, and such a man will seldom find two cows of the same herd of the same turn and capacity. Nutritive ratio, 1:7.3.

6. "Thirty cows, Holstein Friesians; average weight, 1,200 pounds; yield, per cow, of milk, 7,000 pounds; of butter, 300 pounds; average per cent. of fat in milk, for the year, 3.25; cows go dry nearly two months and come in at all times; specialty, farming, butter production and breeding. Ration.—Silage, with very little corn, 50 pounds; clover and timothy hay mixed, 10 pounds; corn meal, 3 pounds; bran and middlings, 3 pounds; linseed meal, 1 pound; cost of ration, 14.6 cents; nutritive ratio, 1:7.8."

7. "Sixteen cows, weight, 500 to 900 pounds; average weight, 800 pounds (estimated); cows go dry about one month previous to calving. Ratio.—Silage, 35 pounds; hay, 4 to 6 pounds; malt sprouts, 4 pounds; bran, $2\frac{1}{2}$ pounds; cottonseed meal, $1\frac{1}{2}$ pounds; cost of ration, 11.9 cents per day; nutritive ratio, 1:4.9."

8. "Same herd as the preceding. Ration.—Silage, 35 pounds; marsh hay, 2 pounds; malt sprouts, $4\frac{1}{2}$ pounds; bran, $2\frac{1}{2}$ pounds; cottonseed meal, $1\frac{1}{2}$ pounds; cob meal, $4\frac{1}{2}$ pounds; also, skim milk and butter milk. Cost of ration, not counting skim milk or butter milk, 15.4 cents per day."

9. "Same as herd No. 8. Ration.—Silage, 35 pounds; mixed hay, 6 pounds; malt sprouts, 5 pounds; oil meal, $2\frac{1}{2}$ pounds; bran, 5 pounds; cob meal, $3\frac{1}{2}$ pounds; skim milk; cost per day, 18.4 cents; nutritive ratio, 1:5."

10. "Same as herd No. 8. Ration.—Silage, 25 pounds; clover hay, 6 pounds; cottonseed meal, $1\frac{1}{2}$ pounds; malt sprouts, $3\frac{1}{2}$ pounds; bran, 4 pounds; corn meal, 4 pounds; cost of ration, 15.3 cents; nutritive ratio, 1:4.3."

Of the last four rations, fed to the same herd, the owner writes thus: "Comparing the last four rations, the farmer says that no better results were obtained when 5 pounds of malt sprouts were given than when $3\frac{1}{2}$ pounds were fed. This is probably because all of the rations contained more protein than was necessary for supplying the wants of the system for nitrogenous nutrients, and the profitable limit was most likely reached already in the case of the first ration."

11. "Twenty-nine cows in herd; 22 Jersey grades, 7 natives; average weight, 1,900 pounds; during the winter, cows in milk averaged a pound of fat each, daily; 4.50 to 4.75 per cent. of fat in milk; cows go dry about two months in July and August; might improve the ration by feeding more oil meal, but do not know it would pay any better; specialty, butter production. Ration.—Cut sheaf oats, 6 pounds; corn silage, 30 pounds; bran, 4 pounds; oil meal, 2 pounds; mixed meadow hay, 10 to 12 pounds; cost of ration, 15.1 cents; nutritive ratio, 1:7.6."

12. "Twenty-five cows in herd; Jerseys, about half the herd two-year-old heifers; milk per cow per year, 4,183 pounds; butter, 224 pounds; cows go dry about one month; specialty, breeding. Ration.—Clover hay, $12\frac{1}{2}$ pounds; prairie hay, $12\frac{1}{2}$ pounds; silage, 40 pounds; bran, 10 pounds; cost of ration, 20.5 cents; nutritive ratio, 1:6.9."

In criticising this ration, Prof. Henry writes as follows: "This is an unusually heavy ration; it seems reasonable to suspect that the amounts of hay eaten are overestimated, as young, light cows could not hardly consume such quantities as those given, in addition to 40 pounds of silage and a liberal grain feed, unless extremely rich milkers."

13. "Same herd as No. 12. Ration.—Clover hay, $12\frac{1}{2}$ pounds; prairie hay, $12\frac{1}{2}$ pounds; corn silage, 20 pounds; ground corn, $7\frac{1}{2}$ pounds; oats, $7\frac{1}{2}$ pounds; cost of ration, 24.8 cents; nutritive ratio, 1:8.3."

In referring to the latter ration, the owner of the herd writes: "My reasons for changing from bran to ground corn and oats are that I can raise and grind the latter myself, as we have our own engine and feed mill, and I think the dairy farmer should always practice economy." Prof. Henry, in his criticism of this ration, applies the same words to it as he did to No. 12.

14. "Forty-five cows, Jerseys and grade Jerseys; average weight, 800 pounds; average yield of milk per cow, 4,000 pounds; average per cent. of fat in milk, 5; cows go dry about one month, some of them during each month in the year. Ration.—Corn silage, 40 to 50 pounds; clover hay, about 5 pounds; wheat bran, 8 pounds; oil meal, 2 pounds; cost of ration, 14.2 cents; nutritive ratio, 1:5.7."

15. "Thirty-one cows, grade and Jerseys; average weight, 800 pounds; average per cent. of fat in milk, 4.17; most of the cows go dry in June to August; specialty, production of milk and butter. Ration.—Corn silage, rich in ears, 50 to 70 pounds; timothy or mammoth clover, 6 to 8 pounds; a bundle of sheaf oats (equivalent to oat straw, 6 pounds, and threshed oats, 3 pounds); oil meal, 3 pounds; cost of ration (taking average amounts), 16.5 cents; nutritive ratio, 1:8.0."

Of the ration of herd No. 15, the owner writes as follows: "The feed is changed every few days; while eating so much silage, the cows were crazy for straw and were fed considerable; keep young stock in good condition on a bushel of silage and plenty of oat straw; fed more silage than ever last winter; cows have done the best they ever did; instead of oil meal only, would use oil meal, corn meal, bran and so on."

16. "Eight cows in herd; Short Horns; average weight of cows, 1,150 pounds; average yield of butter, 175 pounds; cows go dry six to eight weeks, during latter part of summer; specialty, production of beef and butter. Ration.—Cut straw, 10 pounds, mostly barley straw; timothy hay, 15 pounds; whole straw, 4 to 5 pounds; bran, 4 pounds; oat meal, 3 pounds; oil meal, 5 pounds; cost of ration, 14.8 cents; nutritive ratio, 1:10.9."

17. "Twenty-eight cows in herd; Jerseys; average weight, 925 pounds; per cent. of fat in milk, 5.5; yield of butter per year, 350 pounds; cows go dry three to six weeks at all times of the year. Ration.—Corn silage, 30 pounds; cut corn stalks, 12 to 14 pounds (all that they would eat reasonably clean); 10 pounds, one-half each by

measure, wheat bran and corn and oats (one-half each), with a sprinkling of peas; cost of ration, 13.9 cents; nutritive ratio, 1:9.1."

18. "Thirty cows in herd; Guernsey; average weight, 1,150 pounds; average annual yield of milk per cow, 7,000 pounds; of butter, about 400 pounds; average per cent. of fat in milk, 5.11; most of the cows go dry in August, but some come in at different times; specialty, butter production. Ration.—Corn silage, 32 pounds; clover silage, 22 pounds; clover and timothy hay mixed, 5 pounds; bran, 6 pounds; ground oats, 4 pounds; cottonseed meal, 3 pounds; cost of ration, 19.1 cents; nutritive ratio, 1:4.8."

19. "Seven cows in herd; Jerseys and natives; average weight, 950 pounds; average yield of milk per cow, 4,500 pounds; of butter, 210 pounds; cows come in at all times of the year; specialty, breeding and the production of butter. Ration.—Clover hay, 5 pounds; fodder corn, 16 pounds; ground oats, 2½ pounds; bran, 5½ pounds; cost of ration, 11 cents; nutritive ratio, 1:7.6."

20. "Forty-nine cows; registered and grade Holsteins; average live weight, 1,200 pounds. Ration.—Corn silage, 25 pounds; cut stover, 20 pounds; marsh hay, 10 pounds; ground oil cake, 3 pounds; wheat middlings, 3 pounds; cost of ration, 13.4 cents; nutritive ratio, 1:8.4."

21. "Twenty-five head in herd; registered Jerseys; average live weight, 1,000 pounds; product sold as milk, cream and butter; total cash receipt for the same last year, \$84.43 per head; this does not include value of skim milk or butter milk; cows go dry six weeks in July. Ration.—Corn silage, 35 pounds; what hay they will eat clean, about 11 pounds; hay, clover and timothy, principally clover; 8 pounds of a mixture of 5 parts of bran (wheat) to 3 parts of ground oats and 1 part of oil cake meal mixed by volume; cost of ration, 15.1 cents; nutritive ratio, 1:6.0."

In criticism of ration of herd No. 21, the owner writes as follows: "The ration would be improved by doubling the amount of oil meal; last year I fed twice as much oil meal and the average per cent. of butter fat was about one-half per cent. more than this year from the same cows, which I attribute to the oil meal, other conditions being equal. Breeding is the prime business; making butter second. If I was feeding for milk only, I would increase the grain ration."

It will be remembered that the preceding twenty-one rations were all in practical use by some of the best dairymen in Wisconsin and that all of them have apparently given excellent and profitable results.

Dr. Woll, of the station, in commenting upon ration No. 21, reduces it to the following scientific basis, by which it may be compared with those in use in Germany (Wolff's tables), and in the states of New York and Connecticut:

Organic matter,	24.00 pounds.
Digestible protein,	2.28 pounds.
Digestible carbo-hydrates,	11.90 pounds.
Digestible fat,	00.78 pounds.
Total digestible matter,	15.05 pounds.

Giving the ration a nutritive ratio of 1:6.0.

In order to show the near approach of this ration, from a scientific standpoint, to those in practical use in Wisconsin and Connecticut, we condense the following from Dr. Woll's report:

No. of herds.	State.	Dry matter.	Digestible protein.	Digestible carbo-hydrates.	Digestible fat.	Total digestible matter.	Nutritive ratio.
15,	Wisconsin, . .	26.09	2.22	13.58	.76	16.56	1:6.9
8,	New York, . .	24.59	2.21	12.85	.81	15.87	1:6.6
1,	Connecticut, .	25.04	2.02	13.72	.63	16.37	1:7.5
Average for 24 herds in United States,		25.56	2.21	13.34	.77	16.32	1:6.9

A comparison of ration No. 21 with this table shows that it is not as rich in dry matter and is a trifle richer in digestible protein; that it is not as rich in carbo-hydrates; that it is about the same in digestible fat, and that it is lower in total digestible matter, but that its nutritive ratio does not materially differ from the average of the table.

After a careful examination of the scientific and practical results of a large number of dairy rations, Dr. Woll gives the following as containing the different portions in about the proper proportions for the "American cow:"

Organic matter.	Digestible protein.	Digestible carbo-hydrates.	Digestible fat.	Total digestible matter.	Nutritive ratio.
<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	
25.6	2.3	13.3	.8	16.3	1:6.9

With this theoretical ration as a basis, the following practical rations have been established:

Ration No. 1. Corn silage, 40 pounds; clover hay, 8 pounds; wheat bran, 6 pounds; corn meal, 3 pounds; cost of ration, 14.3 cents; nutritive ratio, 1:7.4.

Ration No. 2. Fodder corn, 20 pounds; hay, 6 pounds; oats, 4 pounds; shorts, 4 pounds; oil meal, 2 pounds; cost, 15.3 cents; nutritive ratio, 1:7.7.

Ration No. 3. Corn silage, 50 pounds; corn stalks, 6 pounds; oats, 6 pounds; malt sprouts, 4 pounds; corn meal, 2 pounds; cost of ration, 15.7 cents; nutritive ratio, 1:7.6.

Ration No. 4. Clover silage, 30 pounds; hay, 15 pounds; wheat bran, 3 pounds; corn meal, 3 pounds; cottonseed meal, 2 pounds; cost of ration, 16.2 cents; nutritive ratio, 1:5.8.

Ration No. 5. Timothy hay, 10 pounds; clover hay, 8 pounds; wheat bran, 6 pounds; oats, 6 pounds; cost of ration, 16.5 cents; nutritive ratio, 1:6.6.

Ration No. 6. Fodder corn, 20 pounds; clover hay, 8 pounds; oats, 6 pounds; oil meal, 3 pounds; cost of ration, 16.4 cents; nutritive ratio, 1:7.0.

In order that our readers may have the results of the former 21 rations, with their results and effects, in a condensed form, we give the following table, which accomplishes the desired result in the least possible space, and shows the reader at a glance the character of the feed, the scientific conditions of the ration, its nutritive ratio, its results and its cost, and also gives him the opportunity to compare each with those of Kuhn and Wolff; a reference to the numbers in

the first column will enable the reader, by referring to the list of the first 21 rations given here, to know exactly what these rations were composed of.

SUMMARY OF NUTRIENTS IN RATIONS FED BY FIFTEEN WISCONSIN DAIRYMEN.

Herd No.	No. of cows in herd.	BREED.	Organic matter in daily ration.	DIGESTIBLE.			Total digestible matter.	Nutritive ratio.	ANNUAL PRODUCT PER COW.		Cost of ration.
				Protein (N x 6.25).	Carbo-hydrates.	Fat.			Milk.	Butter.	
			Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.	Lbs.	Cts.
I.	60	Shorthorn and Red Polls, . .	19.61	1.80	10.66	.70	13.16	1:6.9	5,000	260	17.7
II.	27	Gr. Jerseys, *	27.59	2.09	14.45	.75	17.29	1:7.7	5,500	320	13.7
III.	17	Guernseys, . .	22.64	2.46	11.26	.76	14.48	1:5.3	6,143	...	15.2
IV.	18	Holsteins, . . .	25.18	2.11	13.58	.79	16.48	1:7.3	**	...	19.4
V.	30	Holsteins, . . .	27.12	1.79	12.49	.70	14.98	1:7.8	7,000	300	14.6
VI.	16	Gr. Jerseys, +	28.00	3.39	15.14	.96	19.49	1:4.8	...	300	15.3
VII.	29	Gr. Jerseys and natives, . . .	28.96	2.22	15.12	.76	18.10	1:7.6	...	300	15.1
VIII.	45	Jerseys and Gr. Jerseys, . . .	29.00	2.97	14.83	.96	18.76	1:5.7	4,000	...	14.2
IX.	31	Gr. Jerseys, . .	34.81	2.64	18.82	1.03	22.49	1:8.0	...	...	16.5
X.	8	Shorthorns, . .	26.29	1.33	13.50	.46	15.29	1:10.9	...	175	14.8
XI.	28	Jerseys,	25.85	1.80	14.70	.75	17.25	1:9.4	...	350	13.9
XII.	30	Guernseys, . .	24.50	2.87	11.56	.96	15.39	1:4.8	7,500	400	19.1
XIII.	7	Jerseys and natives,	22.47	1.75	12.06	.57	14.38	1:7.6	4,500	210	11.0
XIV.	49	Holsteins and Gr. Holsteins, . . .	25.29	1.77	13.54	.61	15.92	1:8.4	...	...	13.4
XV.	25	Jerseys,	24.00	2.28	11.99	.78	15.05	1:6.0	...	...	15.1
Average for 15 herds,			26.09	2.22	13.58	.76	16.56	1:6.9	5,806	291	16.2
Standard ration according to Kuhn,			20-33.5	\$1.5-2.4	12-14	.4-.7	13.9-17.1	1:5.5-8.0	...	...	...
Standard ration according to Wolf,			24.0	2.5	12.5	.4	15.4	1:6.4	...	...	...

* Average of two rations. + Average of four rations. ‡ Total dry matter. § Albuminoids. ** [6-16,000.]

In criticising the above table, Dr. Woll uses the following practical language:

"A study of the above table will disclose many points of interest to the student of cattle feeding. It will be noticed that the cost of the ration for a cow in Wisconsin ranges from 11 to 19.4 cents, and the average cost of the cow is 15.3 cents; this may be taken to represent what it costs to keep a good cow under our conditions when she is in a full flow of milk and receiving a full ration. It may seem an exaggerated figure to many, but there are two points in this connection which are often overlooked.

First. The prices upon which the calculations of the cost of the rations have been based, are average market prices for our State (Wisconsin).

Second. The manurial value of the feed stuffs is left out of the account in the calculations. We cannot here enter into any discussion of this subject but may state that if all the manure from the cows is carefully saved, its value will represent one-third of the estimated cost of keeping the cow; that is, the fertilizing ingredients contained in the liquid and in the solid manure, would be equivalent to the quantities of commercial fertilizers which could be bought for these amounts of money. Remembering these two points, the average cost of the ration for a dairy cow, given above, cannot be considered as overestimated."

The practical operation of a table of feeding standards, when applied to the selection of a ration for any special purpose, carries with it more or less of calculation and arithmetic, and upon this account the matter is often cast aside by the practical feeder. Since the matter has been given such prominence by nearly all of our feeding stations, the scientific terms are becoming familiar, and many of our feeders, particularly our dairymen, are turning their attention to the selection of well balanced rations, so that less food may be wasted and more utilized in the form of milk and butter.

For want of something better of American derivation, it is usual to take the German feeding standards as the basis of calculation; when consolidated, these may be taken as given in the following tables, the figures representing the amount of each class of food required per day by an animal represented by each item in the left hand column:

ONE THOUSAND POUNDS LIVE WEIGHT REQUIRED DAILY.	Digestible albumin- oids—pounds.	Non-albuminoids— pounds.	Nutritive ratio.
Oxen at rest.	0.7	8.37	1:12
Oxen working.	2.4	14.45	1: 6
Oxen fattening.	3.0	16.55	1: 5.5
Cows giving milk.	2.5	13.50	1: 5.4
Horses, light work.	1.8	12.70	1: 7
Growing cattle.	2.5	15.00	1: 6
Sheep for wool.	1.2	10.80	1: 9
Sheep fattening.	3.0	16.45	1: 5.5
Hogs fattening.	4.0	24.00	1: 6

In referring to the use of this table for compounding rations for live stock, Secretary Bachelder, of the New Hampshire Board of Agriculture, writes thus: "The farmer will ask the question, what shall I do with this table? For a concise answer, I would say, use it as your wife uses her cook book. It gives you the same information relative to feeding a cow that the cook book gives her when she makes cream pie. That is, it tells the amount and kinds of digestible material that a cow ought to have to produce good results. It does not pretend to be the only combination from which good results may be expected, any more than Hood's cook book pretends to have the only combina-

tion of cooking materials which will make cream pie, but it is based on hundreds of practical feeding experiments, and may be accepted by any farmer as a good, safe, practical guide to work by; and if every milk producing cow in New Hampshire could be fed this winter by this table, there would be an increase of more than one-fourth in the milk and butter produced."

The following table is also important, and its results must always be taken into consideration in making up rations for any definite purpose. While the former one shows exactly what is needed to accomplish certain results, this one shows what materials, commonly used as a stock food, will give these results at the least possible cost.

ONE THOUSAND POUNDS OF, CONTAIN.	DIGESTIBLE.		Nutritive ratio.
	Albuminoids.	Non-albuminoids.	
Timothy hay,	3.45	48.71	1:14
Mixed hay,	3.71	47.61	1:12.8
Clover hay,	7.53	48.60	1: 5.7
Oat straw,	1.45	43.31	1:80
Corn fodder,	2.15	41.88	1:19
Ensilage (Northern corn),	1.47	14.80	1:10
Ensilage (Southern corn),	1.83	12.73	1: 9.6
Ensilage (sweet corn),	1.84	14.92	1: 8
Pasture grass,	2.50	10.90	1: 4.4
Potatoes,	1.42	17.70	1:12.4
Corn and cob meal,	7.18	65.52	1: 9.3
Corn meal,	7.78	71.00	1: 9.3
Oats ground,	9.90	68.16	1: 5.9
Linseed meal (O. P.),	28.12	58.21	1: 1.9
Linseed meal (N. P.),	28.67	44.30	1: 1.5
Cotton seed meal,	31.36	42.28	1: 1.3
Shorts,	13.26	52.70	1: 4
Middlings,	13.35	57.72	1: 4.3
Brewer's grains (wet),	4.73	16.22	1: 3.4
Milk (whole),	3.00	14.00	1: 4.6
Skim milk,	3.23	6.94	1: 2.1
Butter-milk,	2.90	4.50	1: 1.5
Green rye,	2.00	12.87	1: 6.4
Sugar beets,	1.50	7.81	1: 6.5
Gluten,	25.14	61.90	1: 2.4

An examination of this table shows that the bulky foods, such as hay, straw and fodder, are deficient in albuminoids (nitrogenous), and that the grains and the class of foods usually purchased are rich in these elements; this conveys the lesson that it is most profitable for the feeder to purchase more highly concentrated food (rich in albuminoids), to feed with his coarse fodder, and that by feeding an

undue amount of either, or by feeding either alone, a large proportion is lost, except for the manure pile.

For milk cows, the European standard, after repeated experiments, is in the ratio of 1:5.4 or 1:5.5, but as Secretary Bachelder wisely writes, "in this country of cheap corn we may, with profit, make this 1:6, or even 1 to 6.5.

But at once the trouble is seen, if we try to use corn meal in too large quantities, because it is deficient in albuminoids just as hay, ensilage and corn fodder are; but cottonseed meal, gluten, middlings and shorts are all rich in albuminoids; and here is where we must look for something with which to make up the deficiencies of our common fodder. Consequently it will prove more profitable to supplement our home-raised fodders with these highly nitrogenous foods. If for each hundred weight of corn meal bought, farmers would buy one hundred weight of either cottonseed meal or gluten, and one hundred weight of middlings or shorts, there would be a great gain in results.

To illustrate the manner of making up a ration from the two tables which we have given, let us estimate the weight of the cow to be fed at 1,000 pounds; we find from the first table given, showing the "feeding standards," that such a cow will require 2.5 pounds of digestible albuminoids and 13.50 of non-albuminoids.

Taking these figures as the basis of the calculation, we may proceed to select the special articles of food from the second table; suppose that, following the example of the New Hampshire station, we take the following:

Ten pounds of mixed hay, ten pounds of corn fodder, three pounds of corn meal, three pounds of cottonseed meal, one and half pounds of gluten; or placing them in tabulated form we find, from the table, that they will give us the desired elements in the following proportions:

	Albuminoids— pounds.	Non-albumin- oids—pounds.
10 pounds mixed hay,	0.37	4.76
10 pounds corn-fodder,	0.21	4.13
3 pounds corn meal,	0.23	1.99
3 pounds cottonseed meal,	0.97	1.26
1½ pounds gluten,	0.37	0.98
Total,	2.15	13.07
Required standard,	2.25	12.15

The ration which we had in view was that of 1:5.4, and the one which we have obtained is in the ratio of 1:6, and the result is too low in albuminoids and too high in non-albuminoids.

The New Hampshire station also give the following ration, bringing in ensilage: Forty pounds of ensilage, five pounds of mixed hay, four pounds of middlings, two pounds of corn meal, and three pounds of gluten; this, in the tabulated form, gives us the following results:

	Albuminoids—pounds.	Non-albuminoids—pounds.
40 pounds ensilage.	0.60	5. 6
5 pounds mixed hay.	1.19	2. 4
4 pounds middlings.	0.54	2. 3
2 pounds corn meal.	0.14	1. 3
3 pounds gluten.	0.76	1. 8
Total.	2.23	13. 4
Required ration.	2.25	12.15

In this case as in the former one, we have a ratio of 1:6, or about the same as before, and with the same slight defects.

Dr. H. P. Armsby, in his "Manual of Cattle Feeding," gives the following as the standard for milk cows:

Digestible protein, 2.5 pounds.
 Digestible fat, 0.4 pounds.
 Digestible carbo-hydrates, 12.5 pounds.
 Total dry matter, 24.0 pounds.
 Nutritive ratio, 1:5.4.

To obtain this ration, and as an example of the manner of calculating rations, he gives the following:

	Total dry substance—pounds.	DIGESTIBLE.		
		Albuminoids—pounds.	Carbo-hydrates—pounds.	Fat—pounds.
12 pounds hay.	10.32	0.62	5.16	0.11
6 pounds oat straw.	5.16	0.09	1.98	0.02
20 pounds mangolds.	2.40	0.20	2.00	.....
20 pounds brewers' grains.	4.60	0.85	3.20	0.16
2.5 pounds cottonseed meal.	1.96	0.79	0.42	0.13
Total.	24.44	2.55	12.76	0.42
Standard.	24.00	2.50	12.50	0.40

CAN FERTILITY BE MAINTAINED BY THE USE OF COMMERCIAL FERTILIZERS ALONE?

By J. G. McSPARRAN, *Furniss, Lancaster, County, Pa.*

In this day, when the profits in farming are exceedingly small, and when every farmer, especially in the East, recognizes the fact that if we expect our farms to be productive we must pay due attention to the application of fertilizers, this question becomes a live, practical

one, to every farmer. As a question of importance, and far-reaching, it commends itself not only to the agriculturist, but to every consumer in our land, or, indeed, in the civilized world. I know full well that in this article I will not be able to exhaust the subject, but if I succeed in giving a few thoughts which will excite to its further consideration, my effort will not be in vain.

We have little sympathy with any man who engages in business and fails, if the failure is attributable to the fact that he gave the business no thought, either before he had thus engaged, as to his capabilities or knowledge of the business, or after he had embarked in the enterprise. Neither can it be expected to elicit anything but ridicule, if a portion of those engaged in agricultural pursuits utterly fail in their vocation when it is, in quite a measure, at least, the result of utter ignorance as to the needs and requirements of the soil they cultivate.

There is no calling in which man is brought as closely to nature as in agriculture. There is no calling which requires more constant thought or study, or more general knowledge. The agriculturist should be thoroughly informed in all that pertains to the production of the various products of the soil, and this covers a vast and interesting field. The successful agriculturist of the future will be the man who understands the nature and composition of his soil; will know quite accurately the composition of all the plants produced, and know further, how much each plant is dependent upon the soil for its nutriment, and thus will know what must be furnished the soil, either through commercial fertilizers or as decayed vegetable matter, or both, in order to maintain the fertility of the soil. And just here, allow me to observe, the conclusions which seem to have been reached by those in our State College and others in a position to know, to the effect that the wants of a soil cannot be determined by chemical analysis, is exceedingly disappointing to many progressive agriculturists. If such is the case, beyond question, and, as a consequence, but the one way open to determine this fact, namely, by experiment, the process must necessarily be slow and often expensive.

The topic of this essay is one in which is involved far more than appears upon the surface. That man, no matter where he may be situated in life—let it be in the very centre of the metropolis, or in the rural district, let him be engaged in a line of business far removed from agriculture, or agriculture itself—must be blind, indeed, must have given little thought to, and as a consequence is ignorant of the general laws entering into and governing all lines of trade and business in their relations to each other, if he has not discovered that much, very much, depends upon a productive soil in any country. How apt we are to suppose that we have learned about all that can be known of any given subject. As a consequence, how often we jump at conclusions, and, after a time, discover how erroneous these conclusions are, and would gladly disown them.

We boast of our magnificent soil, and we have reasons, too, as even foreign agricultural chemists often refer to the rich, virgin soil of America. But, while this is so, how little, comparatively, do we know of our soil and of its capabilities, or even how little do we know about utilizing and improving it? How idle, then, the assertion seems, which we have often heard in the past, that we have about

reached our maximum of production, and soon, in fact, the time for the fulfillment of the prediction is now reached, when we will consume all that we produce in the United States. These assertions appear the more absurd when we look over the fertile fields of France, Italy, Belgium and other European countries, and reflect for a moment that, although their population is dense, and immeasurably so, in comparison with ours, yet they import but a small proportion, comparatively, of their food. How much, then, depends upon a productive soil; and is it not clearly evident that other questions of decided import are naturally involved, or may be, in the working out of the problem to maintain the fertility of the soil? If, for instance, it appears that the fertility of the soil cannot be maintained by commercial fertilizers alone, but will require as well, decayed vegetable matter, it is certainly clear that every farmer in the eastern United States, especially, is interested in equitable freight rates upon our lines of transportation that will enable him to utilize, to the best possible advantage, the agencies for converting profitably the vegetable matter upon his farm into plant food. Or, in other words, he cannot afford to allow the western farmer an advantage in the matter of transportation of products. The question, then, of freight discrimination, would naturally be involved. And again, taking the same conclusion as a basis, in order to enlarge our market and thus enable us, through more remunerative prices, to more profitably consume all available vegetable matter upon our farms, we would need the fullest commercial freedom with other nations compatible with the best interests of our government.

And now to come directly to the answer to the question forming the topic of this article. Without reserve, I answer in the negative. That is, fertility cannot, in my judgment, be maintained by commercial fertilizers alone. I take this position, not because I am not a believer in the use of commercial fertilizers, for such I am; and I have been fully convinced, for many years, that they can be profitably used upon our farms. But I am likewise convinced, through my own observation and experience, and so abundantly supported by the best chemical authorities, that they must be used in connection with, and as a supplement, so to speak, of decayed vegetable matter. In support of this position it is necessary to consider briefly plant life and plant food. Nor must we lose sight, by any means, of the condition of the soil from which the plant grows and from whence it must, to some extent, receive nourishment. Place a plant that derives its nourishment exclusively from the atmosphere upon a hard surface, and it will die. Or, place it in a soil out of condition to assist it in utilizing the nourishment thus obtained, and it will likewise die. The soil is a magazine of inorganic matter which the plant prepares to suit the purposes destined for them in its nutrition. We must not, therefore, lose sight of the important fact that in the application of fertilizers, due regard must be paid to keeping the soil in a proper condition, as well as applying all that is essential for plant food and plant life.

Can all this be done through the application of commercial fertilizers alone? If so, the problem is solved, and I would be obliged to reverse my answer as given above, for we could thus conclude that fertility could be maintained by commercial fertilizers alone; but if the contrary, we would but be strengthened in our position. There is a substance which is essential to this proper condition of the soil, and

which supplies as well, directly or indirectly, no inconsiderable part of the nutriment of the plant, which artificial fertilizers cannot produce. That substance is vegetable mould, or humus. Of what is it composed? Of decayed vegetable matter. Wherein does it exercise such an influence upon plants? In the two ways already indicated; by supplying plant food itself, and, through its presence in a soil, fitting it to do perfect work with other agencies in developing plant life. Its composition, decayed vegetable matter, indicates at once that it must and does contain many of the elements of plant food. The rich, virgin soils of the United States, notably in the western states and territories, are rich in this element and owe much of their productiveness to this fact. This is clearly demonstrated by a comparison of soils. Even upon our own farms we have often observed that certain spots or acres are less susceptible to cultivation than the remaining acres, and in spite of the fact that we give such parts extra care and treatment in applying fertilizers, we cannot often get them in satisfactory condition, when, upon investigation, we will discover they are too compact, and contain very little humus. There are to be found in the western states, sections of land in marked contrast to these rich virgin soils alluded to, which are difficult to cultivate and can never be made apparently really productive. These are known as "hard pan" soil, and are almost, if not entirely, destitute of vegetable mould or humus. There is no doubt, either, that what we regard as the improvident manner in which the western farmer feeds his grain and vegetable matter upon the ground, year after year, maintains, in a great measure, the fertility of the soil by supplying humus.

As we well know, carbon and the elements of water are the principal constituents of plants. In the early growth of the plant, in fact, from the hour of germination until it has assumed that size and developed those organs through which nature has appointed it should derive nourishment in part from the atmosphere, it is dependent upon the roots, which perform the function of the leaves, from the moment of their formation, by extracting from the soil carbonic acid, and that acid is generated by humus in the soil. Humus thus performs in the soil, through certain organs, what the atmosphere performs through other organs, and together they aid each other until the plant is developed, which could not be done with either alone.

The advantage of thorough cultivation by tilling and loosening the soil, lies in the fact that the air is thus admitted, comes in contact with decayed and decaying vegetable matter; carbonic acid is thus formed and the plant, and especially the young plant, has at hand what it needs for its growth and development. With this element, humus, in the soil, even if it contained none of the elements of plant food itself, fertility in the full and proper sense, would be out of the question. A soil rich in humus is mellow and porous, a light soil, not in the sense of lacking richness, most favorable and susceptible to cultivation, freely admitting air and water, and thus combining the elements of soil and atmosphere. Without this element all soils would naturally become compact, tending to the "hard pan" character, and decidedly less productive. If then, the conclusions I have reached, as set forth in this article, are correct, humus is an essential element in the productive soil, and if it cannot be produced by commercial fertilizers or through any combination of them, which has never been claimed, to my knowledge, then undoubtedly the fertility of the soil

cannot be maintained by commercial fertilizers alone. Again, I would say, I would not be understood as discouraging, by any means, the use of commercial fertilizers; on the contrary, there is no question in my mind that, if used judiciously on any and every soil, in connection with the vegetable matter on the farm, it will be with profit. On the other hand, however, so thoroughly convinced am I as to the superior merit of the fertilizer converted into such on the farm, that I would never allow a straw to be removed if by any means it can be retained with any show of profit.

The aim of the American farmer in the future must be to produce at the same expense, two blades of grass where one grew before. To do this and then see that his legitimate profits are not absorbed by others, will call forth the exercise of intelligence, both in the capacity of farmer and citizen.

THE COMING ROAD.

By J. A. GUNDY, *Member from Union, Lewisburg, Pa.*

Change is one of the characteristics inseparably connected, not only with the works of man, but, as well, with all things that come within the comprehension of our senses, whether mundane or stellar. It is, indeed, one of the irrevocable laws of God, and is well expressed by the apostle when he says, "Things which are seen are temporal." The variable stars, the fierce sun eruptions, the fancied light signals from the planet Mars, the rising and sinking of continents, of mountains and of valleys, the rise and fall of empires, the birth and death of human beings, the destruction of one class of works and the upbuilding of another, the grey hairs and furrowed brows, and the unstable tread of men who came into this Board in the prime of life, at its organization, all bear indisputable evidence to the truth of the apostle's words.

Every branch of industry has, to a greater or less degree, been affected by this inexorable law. The country tannery, once so common all through the land, the village shoemaker, the tailor—once a traveling tradesman—the hatter, the wheelwright, the wheel and loom that, within the memory of the older members, were to be found in every community, are now but rarely found, some of them being curious relics of arts almost lost. The musical note of the boatman's horn, the sharp crack of the stage-driver's whip, the clatter of the post horse's hoofs, the Conestoga wagon, with its duck cover, the horseman with his saddle-bags, the weary tread of the homeward bound Susquehanna raftsmen, once so familiar to us, have well-nigh passed into history, and would be relics of antiquity to the children of today.

If, then, the effects of this divine and inexorable law of change are to be seen everywhere and in all the works of men, it would indeed be strange if the roads and highways of the enlightened and progressive nations of the earth were to be the only exception to the law. The

roads constructed on the Macadam and Telford principles are but modifications of the old Appian Way, which led from Rome to Capua, and was constructed by the Roman Censor, Appius Claudius, about 300 years B. C. Surely then, some radical change in the roads ought to be expected to occur, after these 22 centuries of experience. But, you will answer, we have the change in our steam railroads. True, but they stand to our public roads about as the Appian Way stood to the common roads of Rome, accommodating the wants of large communities, but not diverging and reaching out to meet the wants of individual citizens and the farmer.

Numerous propositions have, within the last few years, been suggested. All, or nearly all of them, were intended for the construction of road-beds on either the Macadam or the Telford principles, or some modification of them. We have been asked to construct these roads through the country districts, by bonding the future and mortgaging the heritage of our children for the funds necessary for their construction. Gentlemen, ere we place these burdens on the generations to follow, it behooves to study well the matter, or, as the renowned Davy Crockett expressed it, "Be sure you're right, then go ahead." But are you reasonably sure that you are right in demanding that our public roads shall thus be macadamized even at the expense of a bonded future? Remember, we are living in an age of scientific discovery; invention and engineering move with the stride of centuries, as compared with periods 10 years past. Think you, people of the twentieth century, which is so soon to be ushered in, will you be content with the means of inter-communication and local transportation that is thereby expressed? Will they be content with the accommodations, the speed and the conveniences that have served us? Will they not demand a change in these things commensurate with the change in other departments? Will the change from the mud roads to the Macadam or the Telford system answer their demands? Surely not; the near future will demand such comfort, speed and safety and convenience in country transportation as will place the dweller in the country more nearly on a level with his city brother. Why is it that our country districts are so slowly gaining in population, in many cases even decreasing, while the towns and cities and suburban villages are so rapidly filling up? Is it not largely due to the comforts and conveniences of inter-communication that is offered in the cities over the country, thereby making life more pleasant, more social and more desirable? If these advantages were equal, or at least more nearly equal, many who now prefer the city would then greatly prefer the country.

How shall these requirements be met? What changes will be required, and what are likely to be the peculiarities and characteristics of "The Coming Road?" In a paper read before this Board at the annual meeting in January, 1890, I said that I believed the coming road would be a steel rail. And since then I have had no occasion to change my mind.

I understand the proposition of the advocates of the Macadam road to be that only the more important roads should be so constructed, as the macadamizing of many of the less important would be money uselessly squandered, at least till the population becomes more dense. The cost of macadamizing a road will be from \$1,500.00 to \$5,000.00 per mile, varying according to the manner in which it is constructed,

and the cost of procuring the stone. A writer in a very recent number of the "Scientific American," an advocate, too, of the Macadam system, states that in Richmond and Queens counties, New York, Telford roads had cost \$10,000 per mile, and thinks the state of New York could build 3,000 miles of such road for \$30,000,000.00. You may think this is a high estimate, but it is that of an expert, and should be accepted.

Suppose that in place of thus macadamizing the roads, we construct lines of street railways on the most important thoroughfares of each county, laying double track where the business will require it, laid with steel rails, of either the T shape or the girder or step shape, as will best suit the travel. Equip the cars with motors run by electricity, or compressed air, and making trips as frequently as the traffic will warrant, carrying passengers, freight, express goods and mails. Roads of less importance and individual farms could be reached from these by lateral branches of much lighter rails and cheaper construction. The farmer, then, having his wagon fitted with a storage battery, or a compressed air cylinder, could load his wagon with products, turn on the power, and move to the main line, and here be attached to the first passing train, and taken to destination, or to such point as he may wish to branch off, again using his own power, if need be, to reach a point not on the main line. It is consistently claimed by the advocates of this system that there will be absolutely no occasion for the farmer or other citizen of the rural districts to go upon the roads except in vehicles thus propelled, when the system is once fully adopted. And this system would furnish from the same power plant, and at the same time, light, heat and power for many of the operations of the factories, farms and dwellings along the line of the road. Furnishing the electric current or the compressed air, or both, by a steam power plant conveniently located, or from the now idle water powers of the country, from the mighty force of the passing winds, or from their combined forces; or, possibly, (and this is not the idle dreaming of a theorist), with electric force drawn direct from the great storehouse of electrical energy that constantly surrounds the earth; and some quite extensive experiments in this line are now being made.

Ever since the day that Franklin taught us the identity of lightning and electricity, our scientists and philosophers have been but experimenting and studying its laws, using forces generated in the puny laboratories of man, or by the revolving of a coil of wire but a few feet in circuit, within the field of a magnet measured by a few spans. While this earth is probably one huge dynamo coil of many thousands miles of circuit, revolving at a rate of over 1,000 miles an hour, within the field of a magnet of unknown dimensions; and has been so revolving for unnumbered ages, accumulating in the vast storage cells of interplanetary space, electric energy that cannot be measured or estimated by finite numbers, and there held in waiting till we shall have learned to stretch forth some means to grasp and guide this mighty force fresh from the dynamo of the Almighty and free for the taking. Is it too much to assume that the lightning's blinding flash is but a scintillation from this vast storehouse of energy; a hint from the Almighty of its presence and its availability; the design of an over-provident, prescient Creator for storing the unused forces of the past for use in the more active future? A forethought similar to storing the unused carbon of past ages in the form of coal for the

busy present. These things are not accidental, but are the design of an omniscient intelligence. With the reasonable hope of soon being able to utilize this free and immense force, what possibilities does it open to inventive genius? The contemplation of these grand possibilities bewilder the mind and make us heart-sick for the knowledge that is beyond.

Here will very pertinently rise the question of cost of construction. Mr. Charles H. Davis, a civil and electrical engineer of New York city, and a recognized authority on the subject, says one mile of track, laid with a 50 pounds per yard T rail, complete, will cost, exclusive of right of way, \$5,000; and from his tables of actual cost it can be shown that a 20-mile line, with cars passing every 25 to 30 minutes, with track, overhead wires, cars and power plant, will cost about \$8,000 per mile. But an article in a recent number of the "Scientific American" puts the cost in country districts at but \$6,400 per mile. If this estimate is correct, and I believe it is, and electric roads were constructed along the main lines of travel, through ordinary Pennsylvania farm lands, would it not increase the average value of every acre of land within one half mile on each side of such road by at least \$10 per acre? If so, then this increased value of land alone would pay for the road and its equipment, for in every lineal mile of road there would be 640 acres of such land, and 640 acres, at \$10 per acre, makes the \$6,400 per mile, which the road would cost.

Where will you get the money? will be asked. Well, if we must bond the future, let it be for an improvement in advance of the times, rather than for one that has been relegated to the past. Money can be readily borrowed for such purposes, when real estate security for debt and interest can be obtained. Money by the millions is being put into such enterprises, and in increasing amounts each year, all over the country, penetrating even the mountain fastness of the Tyrolean Alps, and as much, at least, can be done here. Another plan for obtaining money might be named, but I forbear, lest you charge me with being political in this paper, and many of you, I know, under no circumstances do that unless—well, unless you at least give me an occasion.

Will the investment pay? is also an important question. M. R. Davis says that electric roads will pay for operating expenses and repairs and five per cent. interest on capital invested when three fares of five cents each are paid per mile traveled by each car, while making an average number of trips per day. But, if the cost of plant is paid for by the increased value of the land, as shown, then no interests on investment should be charged, and this would leave for operating expenses and repairs about 8 cents per mile per car, or but little over one and one-half fares per mile. Nor does this estimate include any revenue that would be derived from the hauling of freight, mail or express goods, or the furnishing of heat, light and power along the line, which would be quite considerable and a constantly increasing amount. The passenger travel over any line, it would be safe to estimate, would be increased from 100 per cent. to 200 per cent. by the electric road, for Mr. Davis shows that the change from horse cars to electric cause an average increase of at least 30 per cent. Are there not roads in every county in this State that would warrant the expectation of such receipts?

If it is claimed that the interest on the investment, as well as cost of operation and maintenance, must be allowed for; then we offset these by claiming credit for the advantages that would accrue from such a system, and which would be indirectly a source of profit. Among these, a few will be named.

The inflow of the increased population of the country into the cities and towns, in vastly undue proportion, has been referred to and can largely be accounted for by the fact that the cost of distributing materials and the return of the finished product to the railroads, together with the difficulty of getting the necessary number of skilled workmen within easy reach of the factory, has driven most of the manufacturing industries into the cities and larger towns, having competing lines of railroads. The coming of the electric road will change all this, and the extra cost of transporting material and products, and the car fare of the workmen, will be more than overcome by the cheaper lands, lower rents and cheaper living of the country. And with the general distribution of power, it would make the country village a most advantageous point for the cheap production of many manufactured articles. In consequence, truck farming would become a more general industry in the country, instead of being so largely confined to suburban districts, as is now the case.

Our public schools could be reduced in number, from 25 to 50 per cent., and, at the same time, greatly increased in efficiency by the classifying and grading that would follow. So few persons in each district care to educate their children much beyond the proverbial three "Rs" (reading, 'riting and 'rithmetic), of the common schools, that not a sufficient number of the children can be collected in a small district to warrant the expenses of a higher education. In Massachusetts, where the people generally insist on more than the three "Rs" in the common school education, the children are hauled to and from the schools at public expense. And it must soon come to this in Pennsylvania. But, with this railway system established, the children from both town and country could ride to schools located where larger areas for exercise and purer air could be had, and such a curriculum of studies given in the graded schools as would fit the pupil for any non-professional business, or admit him at least to the freshman class in any college.

This system would bring our churches larger congregations and better ministers. It would give us all the advantages of lectures, musical and literary entertainments, church meetings and social gatherings, so common in the towns but so rare in the country. The country people would become more cosmopolitan and less diffident, from being thrown into more intimate relations with each other.

These facilities for rapid, safe, frequent, comfortable and cheap transportation to and from the towns, will induce many to remove to the country who now prefer the towns. For, while having nearly all the advantages of the towns, they would avoid many of its undesirable features. They would have purer air, more sunshine, larger areas for the cultivation of flowers and vegetables and the raising of poultry, more removed from the temptations of the saloon and the various forms of vice and immorality, whose life and growth are so largely dependent on density of population.

The business man could have his office in the town and live in the country; the difference in the rent would pay his car fare. It would always be the best and most desirable class of citizens who would

thus be brought among us. The culture and refinement of city life which they would bring would be caught up by us and our children. Always, and in all places, property located among a community of moral, refined and cultured home owners is thereby greatly enhanced in value. In proof of all this, note the suburban residences in all desirable locations about any of our cities where cheap and rapid transportation is had.

In speed of travel, the electric road has great advantages over the horse and carriage, even equalling steam roads, as they can be run from 100 miles per hour, down to any speed required, but can readily and safely make from 15 to 20 miles per hour, including stops.

In comparative economy, the horse and the footman are "not in it." When a person, in 15 minutes, can be carried five miles for five cents, no man whose time is worth but four cents per hour can afford to walk, leaving out all other considerations.

As for comparative safety—why, it is vastly safer to ride in a steam or electric car than to walk. The claim of the Pennsylvania Railroad Company that the safest place in the world is inside of a first-class passenger coach, on the main line of their road, is not idle bombast, but an astounding verity. The last report of the Secretary of Internal Affairs in the State, shows that the steam railroad travel in the State amounted, during the year, to an equivalent of over 2,584,000,000 of people carried one mile, while the number of passengers killed and injured was only 543, or one killed or injured for every four and three-quarter millions of persons traveling one mile. While the same report shows that the street railroads of the State, during the same year, carried nearly 238 millions of passengers, and killed none, and injured but 61, or about one to each three and three-quarter millions carried. Think you that even one million persons could walk one mile each and only one be injured in any way? While here, an average of four and one-half millions travel one mile before one is injured.

In comfort, the car being supplied with light, heat and protection from the sun, wind, dust and storm, is greatly more comfortable than the carriage can possibly be in inclement weather.

In reliability of service, one road has a record of 30,000 round trips without a single failure. Can the horse and carriage match it?

Do I hear someone say "gush," "Utopian dreamer;" "yes, possibly one hundred or two hundred years hence it may be realized." Let us see what has already been done in this line. The census of 1890 shows that there were, in the year 1889, in the United States, 5,783 miles of street railway, carrying over 2,000 millions of passengers per year, or a number greater than the entire estimated population of the globe. But the electric road is of much more recent construction, practically dating back but ten years, to 1883, when some experimental lines were laid in Chicago, and on the Saratoga and Mount McGregor Railroad. But nothing really practical was done until 1887, when the Union Passenger Railway Company, of Richmond, Virginia, decided to adopt electricity as a motive power. At the close of 1888, thirteen roads were in operation and 114 under contract for equipment. And today there are estimated to be in the United States from 400 to 500 of these electric roads, operating over 6,000 miles of track, with all manufacturers of supplies overburdened with future orders.

The Chicago and St. Louis Electric Railway Company, organized

under the laws of Illinois, propose to construct a double or quadruple track from Chicago to St. Louis, a distance of 250 miles, to run through trains in two hours and thirty minutes, and do all that I have proposed in this paper, except the supplying of charged storage batteries or compressed air cylinders to individual farmers. And does anyone doubt it being done inside of two years? Similar organizations are being planned all over the country.

Yes, the electric road is but an infant industry; and it asks no governmental protection, either, but is moving on with giant strides that indicate that at no very distant day it will exceed all other forms of travel among progressive nations. Yes, the indication is, it will be "The Coming Road," as certainly as time shall last and this earth continue its revolutions.

But you will say, the coming road is a thing of the unknown and the distant future. What do you suggest for the living present and the known? I answer, good judgment, common sense, and a faithful discharge of duty on the part of officers and citizens will do much to improve our roads without an increase of cost.

Let all roads be carefully measured from the court house or the intersection of the most prominent streets of each of the most important towns of a county, marking each tenth of a mile (32 rods) on the fence, or by planting of a tree or post at the roadside, marking thereon the distance from the town in miles and tenths in figures, and marking the end of each mile in more prominent letters and figures, giving also the name or abbreviated name of the town. After having had the roads put in good repair by a road machine, or otherwise, let the supervisor have one or more loads of coarse gravel or broken stone placed at each tenth mile mark, to be used in repairing the road when needed. These broken stones can be used to fill a hole even when filled with mud or water. Then let the supervisor let the repairing of the roads for the ensuing year by public or private sale to the lowest bidder, in sections of miles, half miles, or tenths, as will best suit the adjoining farm and lot owners in size and taxation, always giving preference in aid of the adjoining owners. Require the contractor to immediately repair, by use of the broken stone, any rut or hole that may be found. Thus the roads will be constantly under the eye of the contractor and can be kept good at all times, except in winter or spring, when the mud is excessive, and the next spring will find but little repairing needed. The old maxim, "A stitch in time saves nine," is just as true in road economy as anywhere else. Then, let the road taxes be payable in money, but giving the taxpayer an opportunity to pay in labor or contract work if he meets the competition from others. This would result in much better roads throughout the year, with no additional cost the first year, but a diminished cost or better made roads each succeeding year.

The stage coach has gone; shall the road over which it has so long been driven alone remain unchanged amid this ever-changing scene of life and progress? Shall the faithful horse not be benefited by the march of inventive genius and be relieved of at least a part of the drudgery he has so long and so well performed?

Let us think well ere we consent to mortgage the heritage of our children for money to be spent in making roads on the old system, which, before a generation shall have passed, and possibly, nay probably, before the work shall have been fairly begun, will have become a

thing of the past—gone with the coach, the canal and the packet. Let us rather be worthy exponents, living examples, of the great spirit of progressive change, so peculiar to this age. Let us in Pennsylvania be leaders and not followers of progress and of action in our roads as we are, in some respects, in our agriculture, our manufactures and our schools, and generations yet unborn will rise and do honor to the memory of the men of the closing decade of the nineteenth century, who, forecasting the future, have given them the most progressive and comprehensive road system the world has ever seen.

THE BREEDING, FEEDING AND HANDLING OF DAIRY CATTLE.

BY HON. WM. D. HOARD, *Ex-Atkinson Wisconsin.*

(An address at the Washington County Farmers' Institute.)

Solomon, the wise, has said: "As a man thinketh in his heart so is he." The idea precedes the fashioning of the hand, or else the fashioning of the hand is without meaning or result. Results are invariably based upon ideas. This animal seen here, and this (pointing to the two life-like illustrations of the cow), is the product of an idea.

The cow of today is an artificial creation when compared with the primary animal of long ago. So are we, when we and our ancestors are compared. The German farmer in Wisconsin and Pennsylvania looks back eight hundred years, and he finds himself a serf, bought and sold in many instances with the estate of which he was a part. Has improvement come through his hands, or through the thickness of the cuticle of his hands? No; it has come through the brain! Mistakes have been made. No more costly mistake has been made by many than by their ideas and judgments concerning the dairy cow. Years of unrequited labor, constant toil, and no reward therefor, have been many a dairyman's experience. The American farmer has been more intelligent with regard to the horse, the pig and sheep than the dairy cow. No farmer here is foolish enough to seek to produce the trotting horse, and do so by breeding from general purpose blood. No farmer would attempt to produce the finest hunting dogs of the day, and achieve such a result with the general purpose dog. He might do to "while away the silent watches, in vain baying at the moon," but that is all he would do.

We need an idea—the definite dairy idea—when dealing with the economics of this question. It is truly wonderful how many are not succeeding in this or any other business because they do not use definite ideas to a definite purpose. We have been milking dairy cows that are not paying for their board. The average production in New York is 3,000 pounds of milk, or 125 pounds of butter, or 300 pounds of cheese, worth \$30.00. Does any man believe this will keep the cow and leave any profit? Does he believe there is any encouragement in such dairy work? Certainly not. What shall he do? Turn his serious attention to the definite idea.

Now the original cow is as guiltless of profit in milk as an ore-crushing machine. I know something about it. In 1862, while in far off Texas, I saw 300 or more on the prairies. I rode out to look at them. They had long and spreading horns, and possessed a wild, untamed expression. My saddle blanket was red. A large one raised her head, and made a rapid rush for me. I knew what that meant, and took refuge in flight, precious flight. The enthusiasm of my following could not be questioned, and judged by this, I was as popular a man as ever appeared in Texas. Before me lay a creek, its banks filled with underbrush. A little stream ran lazily through it. There I found shelter. I drew up on the other side. The whole cavalcade came thundering into the brush. But, my friends, there was not a quart of milk in the whole herd of 300!

I know lots of farmers who say the dairy cow is "agin natur." Now I shall only be able to give you a hurried and cursive glance. You see before you here, true crayon sketches of dairy cows, drawn faithfully from photographs of these animals. These cows are not accidents; they are the product of thought and study and evolution. The horse of today is the result of careful breeding and training by man. In breeding dairy cows, one should have recourse to certain specific principles; and first of all, the principle of heredity underlies all breeding; underlying your own life and nature.

The Bible says, "The iniquities of the fathers shall be visited upon the children unto the third and fourth generation."

This shows the vitality of the principle of heredity. The wise breeder seeks to take advantage of this principle for the perpetuation of all good qualities. Yet bad qualities have the same vitality, and here comes in the value of study and judgment to seek how to avoid bad heredities. There is a wonderful power in heredity, and one of the most interesting studies in this direction is the race-horse.

The race-horse of today is a direct descendant of the Arabian horse. This is the fountain source from which is derived not only racing heredity itself, but we also go to the Arab for a knowledge of the primary principles of breeding for speed and endurance. Take this principle, derived from an old Arabian maxim: "Form is everything to purpose." See what a wealth of wisdom there is in it; how it applies to all animals, wild and domestic, and all machinery. Among wild animals, the deer and the wolf, the pursued and the pursuer, have each the form best suited to swift speed. The greyhound, the foxhound, the setter and pointer, among dogs, possess the bodily conformation suitable to the purpose they are designed to fulfill. In cattle we have the beef form, which you see portrayed here in these Hereford and Short Horn heifers. There is no purpose of milk-giving in their construction, although they are females, and parturition will make them subject to a very limited extent to the law of lactation. But you may be sure that with the birth of every calf they would yield as little milk as possible. Turn now to the picture of the Holstein cow Teutonia, the Guernsey cow Select, the Jersey cow Matilda 4th. Mark the sharp contrast in the build and form. It is as distinct as that which exists between a mower and a self binder. Can you not see that there is a powerful law at work here? It simply means a perfection of construction for the work or purpose of their being. Without this adaptation of form to purpose, there will ensue a loss

of energy and a failure of purpose. The logic of this law is this: In your selection of domestic animals, be governed by a specific purpose. You will produce speed to the largest result and the greatest economy with a speed-bred horse; you will make butter with the least cost from a butter-bred cow. Breed and form are the foundation; feed and proper handling are the developing agencies. There must be wise adaptation in these agencies, to the purpose desired, as well as in breeding. Have a purpose.

The power and potency of heredity is the foundation of the breeder's work. I once witnessed a convincing illustration of this while attending a lecture delivered by an English veterinary surgeon in Philadelphia. He was showing the class the effect of long, continued breeding for a distinct purpose on the bones of a horse. He exhibited two specimens, each a two inch section, both taken from the hind leg between the fetlock and the gambrel joints. One was from the leg of a Conestoga draft horse weighing nineteen hundred pounds; the other from the leg of a thoroughbred race-horse bred in Kentucky.

The bone of the draft horse was considerably the largest, while the bone of the race horse weighed the most. The latter was like ivory, or the bone of a deer. The lecturer declared that the bone from the race-horse was in life capable of greater tensions than a piece of steel of like size. He illustrated this point as follows: "This race horse weighed 950 pounds. His average leap in a race was nineteen feet. The bones of his hind legs withstood the shock and strain of throwing 950 pounds nineteen feet at a throw, for a mile, and no two pieces of steel ever forged could have withstood such a strain. I am reminded of an incident in the history of the War of the Rebellion which shows how the fate of a great battle, and peradventure the nation, depended on the specific purpose breeding of a horse. It was at the battle of Cedar Creek, in the Shenandoah Valley, October 19, 1864. The Eighth corps had been crushed and turned into utter rout. Early was fast winning a great victory over the Federal forces. Untold disaster to the Union cause hung upon the fateful wings of that direful morning, and Sheridan was twenty miles away. The inquiry is forced at once to the lips, "How is Sheridan mounted? What kind of a horse now carries the fate of a nation on his back?" Thank Heaven! he is mounted on Rienzi, the noble thoroughbred, a horse bred from 2,000 years of distinct heredity for a special purpose. There was that same thoroughbred, bone-toughened sinew, well-adapted form, and above all, the fierce spirit, game and endurance—all the result of heredity.

What do you think would have been the fate of that memorable contest, if Sheridan had bestrode a Clydesdale or a general purpose horse? What is the certain fate of that farmer who starts out in dairy farming mounted on a scrub cow? You have all heard the story of the old farmer who undertook to show his boy how to break a pair of yearling steers. The boy had one steer in the yoke and the father said, "I'll show you, John." So he put his own head in the bow at the other end. The boy gave the steer a jab with a fork and he started, taking the old man with him, down the road at a break-neck pace. Meeting a neighbor, the old man howled out: "Here we come! blame our fool souls. Somebody stop us!"

Now, friends, the time is past and gone, in these days of sharp com-

petition, when expense attends every step of the work of the farm, when home and children are to be educated and cared for, that a man can hope for substantial success or profit with the ordinary cow.

I consider the best dairy breeds to be the Jersey, Holstein, Ayrshire and Guernsey. There are modified species of other breeds. Let me say to you that this milk-giving function is as much a matter of heredity as speed in a horse, scent in dogs, or game in fighting cocks.

In breeding, we breed first to certain form. There is a dairy form in cattle, based first on nervous temperament. Every temperament gives distinct form. In the pictures before you, you see an illustration of the flesh-making and milk-making forms and temperaments. We see here the dairy temperament. It has the form of maternity. The dairy cow has the highest expression of maternity. Everything about her, as you see, has a reference to maternity. The high poetic structure plainly denotes this. See the outline of a dairy cow. Not straight, but rather a rugged outline of back. Here lie the organs of maternity. The dairy cow should have a strong back bone. Through this the brain sends its current of nerve support. This spine contains the great battery which support the milk-giving organs. The function of milk-giving makes the largest drafts on the nervous force, of any other function of the body. It is all absorbing, in this respect, providing the cow is a good one.

Hence the back bone, which contains the great channel of nerve communication from the brain, should show, by its strong and rugged conformation, that it is ample and sufficient for this purpose. In confirmation of this, Prof. Robertson, of Canada, told me that he saw the skeletons of various farmer's cows in Denmark, and he was struck with the remarkable development of the back bone.

I place great value on this one feature, for no matter how much capacity the cow has, she must have a strong back if she sustains that capacity. I have seen a great many talented cows, as well as talented men and women, who were weak in nervous force, who could not carry out the purpose of their talent.

The general build of the cow should show femininity, and there should be a relaxed expression about the body, for milk-giving calls for relaxed conditions. The cow should have a broad muzzle, large nostrils, strong muscular jaws, a slim neck, retreating dew lap, sharp shoulders, rather light loins, and the ribs should be wide apart and spring from the back bone not as squarely as in the beef animal.

See this great udder, the mammary gland. It is the center of unfathomed mysteries. Paul speaks of the "mystery of godliness." Greater still is the mystery of motherhood. I desire to show you mammary gland, and to do this most clearly, we will take a case of how wonderfully and closely connected with the nervous system, is the milk fever for illustration.

Milk fever starts in the uterus, and rarely occurs after three days from parturition. It is usually preceded by a chill. Surrounding and interlacing this udder is a marvellous net work of nerves, called the sympathetic flexus. This chain of nerves runs from the udder to the uterus, and from there to the spine and brain. We can see by this how intimately connected with the nervous system are all these maternal organs, and the function of milk-giving. The moment milk

fever sets in, the nerves telegraph to the udder, "Stop all milk secretion." Inflammation spreads along this nervous channel until the spinal marrow is reached, and paralysis of the hind parts ensues and death soon follows.

What lesson should we learn here? This; that if we wish to make profit from the motherhood of the cow, we must treat her like a mother. We must promote her comfort, and particularly keep her warm. Every mother knows that cold and discomfort interferes greatly with milk secretion. We must be always obedient to this nervous equation, and for our own profit, if we care nothing about humanity, we must treat this mother gently and generously. Farmers need to look into this matter of cow comfort. Because they have refused to conform to it, millions of dollars have gone to waste.

Riding along through New York and Pennsylvania, I have seen hundreds of herds, on a cold day, wandering about the fields ankle deep in snow, forced to travel a quarter of a mile, may be, to drink ice water out of a creek. More than this. I have seen old New York dairymen hauling hay, worth \$15 a ton, away from the barn and feeding it to their cows on the snow.

We have a right to say that such men are no dairymen; they are not students of the cow, of their business, nor their profits. No wonder they are constantly crying, "Dairying don't pay."

A woman would not handle cows this way. She is a mother, and she knows how a mother should be treated. I have known over sixty women who were engaged in dairying and the breeding of dairy cattle, and there is not a failure among them. My wife has taught me many valuable lessons.

An instance happened twenty-six years ago. We were traveling together, with our infant boy. Unexpectedly my wife took a chill. "I am sorry this happened," she said, "for it means loss for the baby." I asked, "What will you do to restore these functions again?" "Why," she says, "I will endeavor to get warm;" and at once I saw the principle of motherhood. At once I experimented. It was a success. I think I am the first to advocate the giving of warm water to cows to promote the flow of milk. And so I brought out the theory, when, to my astonishment, every old lady in the land had known all about it for years. We live close to the truth, and often doubt its existence.

Cows should have, first, good stabling and warmth; second, kindness must be the law of our treatment. There is often a great deal of cruelty in our treatment.

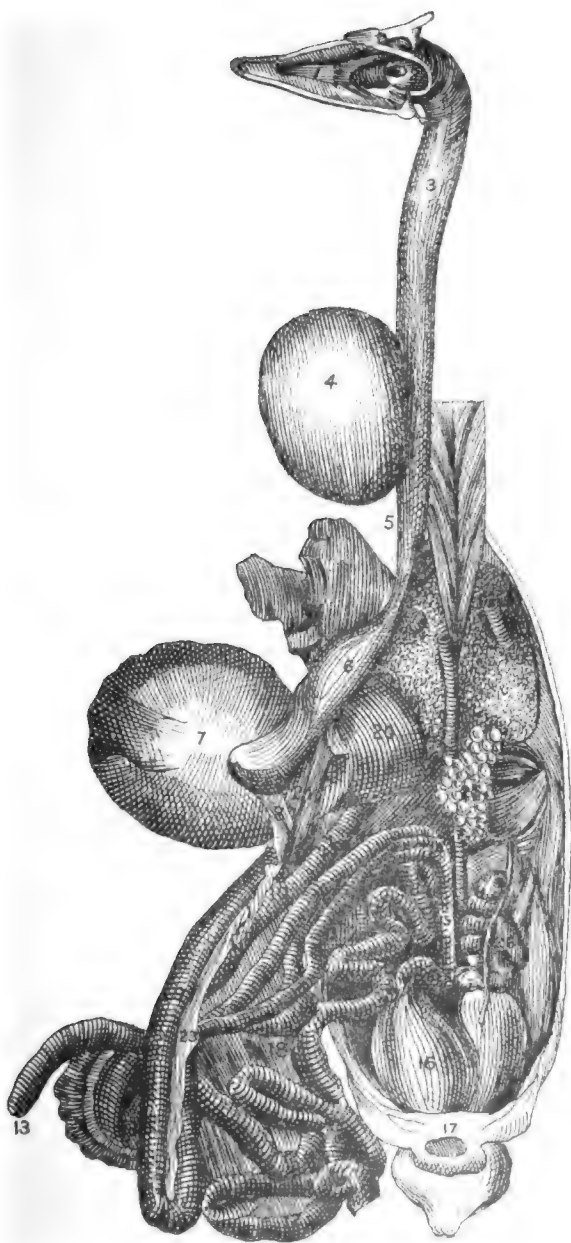
See here, in this illustration are two cows; one standing, the other lying down in their stall. You see here in front a rack sloping inward. A passage between two rows of cows. Here (pointing to a neat and practical illustration of comfortable stabling, etc.), is a board partition, four feet high. The floor is tight. See this rack for fodder and hay before each cow, spread at the top twenty-six inches, and inclining toward the cow. The slats in the rack are four inches apart.

I have been looking for years for proper stabling. I disliked the stanchion; they are for man and not the cow; and so this came to my notice. Just forward of her hind feet a strip is nailed across the stall, three inches high. Inside the strip, on the floor, is the bedding, which will last three months. The animal consequently has a dry,

clean place to lie. She may lie across the strip once or twice, but not more. The stall is four feet wide. Here you see an opening, or space, in the partition in front of the cow. This is for the ensilage and grain feed. A cow lies either on one side or the other, (laughter). If she lies on her left side, place her feed box to the right, low down, etc. Incline the feed box toward her, so that she may easily get all the feed. My cows are as clean to-day (Feb. 3), as they would be in June pasture. They are tied with a halter. Have it fastened to the center of the rack by a screw ring, and tie with a halter and three feet of rope. The halter end should have two snaps. It is a very easy thing to snap it into the halter ring, under the throat. This system of stabling is humane. With the stanchion the cow is strained and stiffened. This way is comfortable and easy; besides, cleanliness is a matter of great importance to the comfort of all concerned. A word in regard to the feeding of dairy cows. A dairy cow, my friends, needs to be fed from a dairy standpoint, and not that of a beef animal. Milk in quantity and quality is to be considered.

Four per cent. of milk is butter-fat, and nearly the same amount is casein. This latter substance is almost pure protein, the element that makes muscle and nerve. The cow cannot give fat without giving casein. In feeding for butter, it is the fat you are after, but you must also feed for casein. Now, casein is highly nitrogenous, and must call for a nitrogenous ration to supply it. It is for this reason we find ourselves compelled to feed bran, oil meal, cottonseed meal, gluten meal, pea meal, clover hay, and a variety of nitrogenous foods. You cannot feed fat and starchy, or heat-producing foods alone, for the reason milk is not composed of fat alone. Right here lies the science of feeding. There is big profit in studying it.

There is constant need for the exercise of economy in feeding; but what is economy? Many farmers think it is starvation; that is their definition, and their cattle show it. There can be no true economy without expenditure. The meaning of the word is not going without that which is necessary, but rather a wise administration of expense. Now the production of dairy food on the farm is a part of true dairy economy. I have been pleading for years, by tongue and pen, to induce dairy farmers to enter into the cultivation of peas. I made a special study of the pea plant for two years before I commenced to urgently recommend them through the columns of "Hoard's Dairyman." They are among the most valuable of butter foods, being nearly equal in nutritive value to oil meal. In practical feeding for butter results, I think two pounds of pea meal are equal to six pounds of ordinary bran. A fair crop is twenty-five bushels of peas per acre, which, reckoning bran at \$15 a ton, would be equal to \$45 worth of the latter. Cost of production is the great drawback to profit in dairy farming. We cannot affect the price of butter very much, but we can, by intelligent study, greatly reduce the cost. Extra cost of a pound of butter comes in three ways. (1). By poor cows; keeping two cows to get the yield one good cow should furnish. Yet thousands of farmers are content to do this foolish thing. (2). Refusing to make a study of the feeding question; refusing to believe that there is a place right here for reading, thought, study. (3). In improper handling and treatment of the cow. A great deal depends on keeping the cow machine in good order. Careful, intelligent handling pays im-



DIGESTIVE ORGANS OF A FOWL.

mensely. But few, comparatively, of the farmers who keep cows, are good handlers. Their fathers before them handled their cows so and so, and that is enough. If the cow is not satisfied, so much the worse for the cow; the owner rarely thinking that when the cow is not satisfied, it is so much the worse for him.

Attention to the principles of dairy breeding will give us the foundation of a good cow. Attention to the principles of feeding will develop and support the functions of that cow. Attention to the environment and handling of that cow will stimulate and encourage the highest operations of those functions to our profit. There is a big chance for brain work all through it. Study to increase the product of the cow; study to decrease the useless expense, but never decrease necessary expense. Study to have the stabling and housing absolutely healthful and absolutely comfortable; not according to your notion and convenience, but to suit the notion and convenience of the cow. She is the one who gives the milk. Absolute kindness and gentleness should characterize our usage at all times. Commence with the calf to develop the cow.

You can do wonders here if you have a mind to. Accustom to daily handling of the udder. That will go a great ways towards the development of the udder. Besides, you will never have to break them to milk. I will always pay considerably more for a horse or cow that has been well brought up. I can only make brief statements of general principles. One thing more. The dairy cow, to be profitable, must have a good dairy cow constitution. That means a constitution that belongs to a dairy cow, not a bullock. Her work calls for serious strain, every day, on the digestive and nervous functions. She must possess strong vitality, or endurance, in her work. That we call constitution. Many men mistake hardiness for dairy constitution. They want the cow that will bear neglect, cold, and poor food and shelter, and still live. You can find plenty of such farmers and such cows. But no good, profitable dairy cow can do it. She has plenty of other work, manufacturing milk and butter, to use all the surplus vitality she possesses; if I force her to expend it as a result, for a bare living, I am a fool. One of the best indications of constitution, in man or animals, is a strong, full development of the abdomen about the navel. This matter of vital force and endurance is imparted to the progeny through the mother. It is largely a matter of construction. The mother supports the foetus through the umbilical cord. That is the channel. Now, if the channel be small and weak, the support of the mother will correspond. Often the size will not be affected, but the character and vital force will. The umbilical development is simply an indication of the size of the umbilicus or cord. As I said before, if it is full and ample, it is the best sign of endurance I know of. Constitution, however, does not indicate talent or capacity, but rather ability to endure the large work of talent and capacity.

A word as to stable management. I wish I could prevail on every dairy farmer in the land to provide himself with plenty of land plaster, and use it in the gutters and cow stalls every day. You cannot do a more profitable thing. Gypsum is a powerful absorbent of ammonia, which is thrown off in the urine, and which is an irritating gas, and unhealthful, in all close stables. Ammonia is one form of

nitrogen. You pay from 9 to 19 cents a pound at wholesale for it in one form or another, when you buy commercial fertilizers. Yet many dollars worth go to waste in our stables, because we are indifferent to the exercise of sound knowledge. Gypsum, or land plaster, will absorb it at once, and hold it, ready for your growing crops. It keeps the floor from becoming slippery, and purifies the air of the stables. Its cost is trifling; its benefit is great.

FARMING FOR PROFIT.

By J. B. SHANNON, *Member from Jefferson, Pa.*

That farming, in a general way, is less profitable than formerly cannot be denied. There are many causes for the depression in agriculture, among those most frequently mentioned, being over-production, discrimination in freight rates, unequal taxation, unfair legislation and others, both real and imaginary.

Less than a score of years ago, farmers were almost unanimous in the verdict that farming paid fair returns for the labor and capital invested. Wheat was the principal crop, supplemented by beef and pork. With the advent of improved harvesting machines the capacity of the grain-producing prairies of the west were largely increased, and we contend that their use has stimulated the production of wheat much beyond the requirements of the world. This, in a great measure, is the fact that accounts for the constantly declining price of this cereal.

The complaint that "farming don't pay" has had its effect in driving from the farm many of the young men who would have made the successful and prosperous farmers of the future. I believe that wheat can still be raised at a profit in Pennsylvania. We should curtail our acreage at least 50 per cent. and, by applying the same amount of labor and fertilizers to the decreased acreage, we will not only be able to double the yield, but, in other words, under the new and better system, we would realize from fifty acres the same amount that was formerly garnered from the double acreage.

This would give us not only increased profits, but the remaining acreage could be profitably devoted to other crops. There is no reason why the present average of thirteen bushels per acre in Pennsylvania should not be doubled, under an improved and more thorough system of wheat culture.

The land gained under the plan proposed could, to a large extent, be devoted to raising hay. Under ordinary circumstances the yield per acre should average two and one-half tons. Under the existing prices the crop would certainly be one of the largest and most profitable sources of income on the farm. We would not advise that the entire crop should be sold, because we recognize that it would remove fertility from the farm that we could only replace at a considerable expense and trouble from another source. To maintain the fertility of the soil should always be a consideration of the first importance. There is no way in which the hay crop could be disposed of, to better

advantage, than by feeding it to good dairy cows. The dairy business is only in its infancy, and there need be no fear that we can depress it in this period of the "new dairy."

To make the dairy pay is a comparatively easy undertaking if we follow certain business methods, and endeavor to adopt the established rules that will ensure cleanliness; and by a most thorough and careful attention to the methods that are prescribed by the leading dairymen of the State, whose valuable contributions upon this subject have appeared from time to time in the dairy journals and the leading agricultural papers of the country, we may hope to succeed.

I am in favor of making the butter at home in place of sending the dairy product to the creamery. Endeavor to produce only the best quality of butter; stamp your own individuality upon the excellency of the butter, and your success is assured. Good butter will always command good prices. There is no doubt in my mind, however, of the fact that creameries have succeeded in raising the standard of quality of butter, in a large degree, but I am inclined to believe that it is the individual dairy that will continue to produce the highest grade.

I do not intend to specify any distinct class of cattle as being the most desirable for the dairy. Let us keep a sharp lookout on the milk pail and on the butter tub. The writer undertook this task a number of years ago and can attest to the value and success of the experiment.

By a system of judicious selection, my herd of 18 head produced gross receipts averaging \$136.00 per head for the past year, and I firmly believe that this amount can be greatly increased in the future.

Diversified farming will continue to yield the safest and surest returns. A large majority of the farmers entirely overlook the value and importance of the garden. It would be profitable, in nearly all cases, to devote not less than about four acres on every farm to rhubarb, berries, peas, beans, tomatoes, cabbage, etc. There is no reason why the farmer should not have sweet corn for his own table, as well as the market, from July 10 to the middle or latter part of the month of October. Vegetables are not only profitable, but add to the health and pleasure of the family. In too many cases the town and city people alone realize and appreciate the value and benefits of a liberal supply of vegetables.

While we are complaining about the depressed condition of agriculture, let us take a glance at the potato crop of the present year. With the prices ranging from 85 cents to \$1.00 per bushel, even with the decreased yield, compared with last season, the crop is a most profitable one. My own experience has demonstrated that even in an "off year" the crop will yield as largely in financial returns as in the season when everybody has a large surplus for the market. Thorough cultivation will ensure a fair return, though the climatic conditions may be unfavorable. An indifferent effort in an unfavorable year will never produce any satisfactory results, as the crop, under such conditions, cannot prove otherwise than a complete failure.

Another source of income for the farmers along the Juniata is the peach orchard. The experiments in fruit culture in this valley have at least met expectations. The land devoted to peach orchards, as a rule, is not adapted to agriculture, but, under careful treatment, the peach trees flourish and seldom fail to produce a large crop of fine fruit. Many of the farmers of the Juniata Valley realize from this source a most substantial and satisfactory source of income.

FRUIT GROWING A SPECIALTY.

BY G. T. POWELL, *Director New York Farmers' Institutes, Ghent, N. Y.*

I am to speak to you in relation to "Fruit Growing a Specialty," and I think that in this field we will find the greatest profit that is to be found in fruit culture—that is, making a special business of it. It is the tendency of the age in which we live to run into specialties; there are those who make dairying a specialty, and those who do so intelligently are getting the best results, get the most out of their cows, make their butter in the finest manner, and market it so as to get the best prices. Those who make specialties in any direction always reach the highest point of perfection in their work. But, while this is true, it is also true that those who make a specialty in any one direction are liable to heavy losses, because, when misfortune comes to the one thing of which they have made a specialty, they have nothing else to take its place; so that while specialties have their advantages, they also have their drawbacks and possible losses.

I think that we have reached a point in fruit culture when the man who expects to make money out of it must devote his whole time, mind and money to it and make it a constant study to meet the requirements of the case as it stands today, because we are confronted with difficulties today which were not known half a century ago. And if we do not meet these difficulties that we find in our way, much of our labor will come to naught.

It is true that we have had abundant crops of fruit last year, of all kinds, and the same is also true of all the crops of the farm, for grain and other crops have been unusually plentiful. Never, in the history of our country, have we seen such an abundance of fruit, and, as a natural result, prices have been low; and yet, low as they have been, if you will figure the matter up carefully, you will find that, even at the low prices which have been ruling, apples have netted the grower more than any of our ordinary farm crops.

In order to meet this question properly, and to treat it in all of its bearings, we must treat it in its relations to the people of the different counties of our State. You must study the special condition under which you, as individuals, live, before you can decide upon the proper course to pursue. In one section of your State the fruit grower has a large crop of apples this season and, on account of his location, he was not able to realize full prices, because transportation charges ate up much of his profits. There are many who live in remote places, away from the main lines of railroads, and hence they cannot ship at a fair profit to the general market. My advice to those so situated is to consider the situation well before they try to ship long distances. In most cases, evaporated fruit will give more profit, with less outlay of capital, than the green fruit. Those who can reach Harrisburg, Philadelphia, Pittsburgh and other good markets to which fruit can be shipped fresh, may dispose of it in this way to advantage; but, when you get back from the main lines of travel and transportation, where orchards have been planted and where, in years like this, the fruit

cannot be shipped in a green state, there establish your evaporators and thus afford a place where it will pay to market your fruit, and when it is dried it can be packed away in boxes or barrels and for one-quarter of the expense, can be shipped out at the proper season, not only to your own markets, but also to Europe and other distant markets, in which you can compete with any class of producers on an equal basis, and in this way many acres not now profitable may be made profitable, and the income greatly increased.

What I have said in relation to apples is equally applicable to peaches. There never was such an amount of this kind of fruit raised in any one year as there has been this season, and it may be half a century before we will get another such crop. But you may plant your peach trees in locations away from transportation almost as profitably as in counties close to a good market for green fruit, and you can bring enhanced profits and utilize much land that is now producing no income. This also applies to the culture of small fruits, the strawberry, raspberry and blackberry; all of them can be raised with profit because the value of the land is not so great as in more favorable locations, and you may safely plant your black-cap raspberries and blackberries by the one, two or five acres, and give your time and attention to this small area with the expectation of as much profit as you usually obtain from much greater areas planted with ordinary farm crops. But do not attempt to ship them green. Put up evaporators and then you are on an equality with other fruit growers. There are many acres which farmers might devote to the culture of small fruits and even larger fruits; tracts of 10 to 15 acres which could thus be made to return larger profits than 150 acres devoted to general farming, because in them the profits per acre are so much larger and the work more concentrated.

But, in order to be successful, we must fit ourselves with the knowledge and information, and with all the appliances for meeting every difficulty that may arise. This year there was such a large amount of first-class fruit that the inferior article was practically out of the market, and yet in the midst of all this abundance, when much of the fruit sent to market barely paid the freight and cost of picking and marketing, there was fruit sold in the market at high and remunerative prices. I have known that when some kinds of peaches were selling slowly at from 20 to 25 cents per basket, others were selling freely at from \$1.00 to \$1.50 per basket, and the same was true as to apples and, in fact, all kinds of fruit in their season. I have seen apples selling at prices that were not remunerative, and I have, at the same time, seen them selling at a clear profit over all expenses of from one to two dollars per barrel, and all this difference comes from an intelligent management of the business.

Now, let me allude to some of the difficulties which are to be met with in this business. In the first place, we are troubled with the serious interference of insects and with sundry diseases. There appears to be an increase in insect life within the past 30 years. I think that it is largely due to the fact that we have so rapidly denuded our forests and have practically driven many of our insectivorous birds out of the country; by breaking up the homes of these birds we have permitted an increase in the number of insects which prey upon our fruit and fruit trees, and now we are compelled to use appliances, not formerly thought of, to prevent the destruction of our fruits.

Our increase in population and our transportation facilities have been such as to make it easy for us to reach all the nations of the earth, and with this we are constantly bringing in new species of insects and new diseases that seem to find congenial homes, and some of which promise to become very destructive to our fruit-producing interests. At your meeting at Gettysburg I spoke to you in relation to an insect which I feared would eventually do great injury to our pear orchards, and I may now say that, in spite of all my labor and care, this insect did cut me short of at least 1,200 barrels of first-class pears. It promises to sweep out of existence the pear orchards of our country. Dr. Lintner, in speaking to me in reference to it, asked me what danger there was of its attacking the apple crop; he asked, "Is there any possible danger that this insect will turn its attention to the apple?" This is a somewhat alarming suggestion, when we consider the losses it would occasion and the labor which would be necessary to prevent its injuries. If it spreads over the country, it becomes an important question as to whether the apple crop may not suffer as much as the pear. Thus we see the great importance of organization and working for the destruction of these pests, using all the knowledge and appliances that we may have at hand.

At your Gettysburg meeting, I think I alluded to some of the leading pests of the apple crop, and it may do no harm to again call your attention to some of them. The apple, after all, is the great standard fruit of the country; we may speak of our peaches, of our pears, and of our plums, but apples are our great standard fruit, and hence, I place it first in importance of all fruits grown in this country.

One of the most destructive insects to the apple crop is the codling moth, an insect which deposits its eggs in the apple early in the season and as soon as it is formed, and it goes on boring through the fruit, either destroying it entirely or injuring it in its market value. There is a very simple plan to prevent its ravages, and by which it can be successfully met and conquered, and that is by spraying with poisonous materials. Dissolve one pound of Paris green in 200 gallons of water, and spray the trees just after the blossoms have fallen; the first spraying should be done at this time, because the newly-formed fruit has its calyx end turned up to the sunlight and the most minute drop of the liquid that can be gotten into this calyx, will destroy the worm effectually and completely before he has done any damage at all. In about 10 or 15 days after the first application, repeat it, and in about 10 days more, give them the third application and you may have 90 per cent. of your fruit as perfect as if there was no such thing as the codling moth. I have this season shipped 600 barrels of apples to Europe at prices which were very satisfactory to me, and their quality was mainly, if not entirely, due to spraying in the manner which I have described. If properly done, it will save fully 90 per cent. of your fruit and make it in first-class marketable condition instead of second or third-class fruit, and may turn a loss into a good profit.

We have other insects, as the black and green aphid, which attack our cherry trees. My own experience this year, in this respect, was very satisfactory. I used the kerosene emulsion, and I have brought samples of it here for your inspection and examination.

Those of you who have cherry trees know that, at certain times, the

leaves curl up and, as a result, the next year you have very few cherries. This is caused by the attacks of the aphids before spoken of; it sucks out the strength which should have gone to the formation of new wood and fruit buds for the next year's crop, and these buds, being but imperfectly developed, you have no crop.. For this I use the kerosene emulsion, which is made by mixing one-fourth of a pound of hard soap or one quart of soft soap, two gallons of water and one pint of kerosene; mix them together in this proportion and by stirring or forcing with your pump, thoroughly mix them until you have an oily mixture or emulsion which will not separate readily on standing. To 12 gallons of water, add one gallon of this mixture, and thoroughly mix both together. With this emulsion you will be able to destroy these forms of insect life. It does not act as a poison, for the aphid does not eat; it acts by closing their breathing spores and thus deprives them of life by suffocation.

This class of insects increases with great rapidity; in the early part of the season they lay their eggs; these young at once lay eggs and the ratio of increase is so great that figures give but little idea of it. They mature in ten days and, when we consider that there are millions and millions of them, it becomes a wonder that we can secure any perfect fruit at all.

Now, in relation to fungus troubles: I have seen some trees affected in your State. There is a disease of apples called scab, which causes little black spots which very much injure the sale of the fruit. Last year there were millions of dollars worth of fruit lost by this scab, which injured the fruit so that it was not fit for market, and would bring but second or third-class prices. Proper spraying will prevent all of this loss and give us sound and perfect fruit.

It is said that "an ounce of prevention is worth a pound of cure," and this is especially true in relation to spraying fruit; it is much more easy to prevent than to cure, and hence it is important that it be done early in the season, in order to prevent the growth of either the insects, or the fungus, as the case may be. One spraying at the proper time is worth many later in the season and, after a certain period has passed, it is entirely useless and is labor lost.

For many of our fungus troubles, the copper mixture is excellent and the best that we know of; it is made by mixing five ounces of carbonate of copper and three pints of aqua ammonia, of 26 degrees strength, in 50 gallons of water. This application I would put on the grape before a single green leaf appears, and again after the blossoms have dropped; if a rain follows, spray again, and follow it up by sprayings about 10 days apart. This will give you clear, bright and healthy fruit, and the foliage will be green and handsome.

MR. SEARLE. In your opinion, has excessive foliage anything to do with favoring the propagation of the grape mildew?

MR. POWELL. No, sir; I think that the more foliage that we have, the better, because it is through the foliage that the fruit is developed and ripened. I know that some have cut out part of the foliage, thinking that if the sun shone on the fruit it would ripen better; but this is a mistake, because you thus deprive the fruit of that which is necessary to produce color.

MR. SMITH. How can you prevent black rot in grapes?

MR. POWELL. Take six pounds of sulphate of copper and four pounds of lime, and dissolve them in six gallons of water. Add to

this sixteen gallons of water, and by spraying you can effectually prevent black rot. This should be applied early in the season. It is not difficult to prepare, and is not expensive. Sulphate of copper can be bought for seven cents per pound, and the lime costs but little.

The reason why I claim that, sooner or later, fruit culture will be profitable, is that, owing to insect and fungus ravages, many will go out of the business and will leave it to those who will exercise the proper care and go to the necessary expense and trouble to save the crop. To illustrate the possible profits where the business is properly conducted: In Greene county, New York, which adjoins my own county, one man realized \$9,000 for his crop of plums. He gives his whole time and attention to his plum orchard. He started early in the spring and kept his cultivators going almost continuously throughout the season. New York buyers came in September, and have paid him \$9,000 for three years in succession; they come there with their packages, pick the plums, pack them, and all that he has to do is to deliver the packages at the steamboat; you can imagine the profit on the land at \$9,000 for the crop on twelve acres.

MR. SEARLE. How did he guard the plums from the curculio?

MR. POWELL. He had but little trouble with the curculio because his trees were on heavy clay land; the soil is too compact and the curculio avoids such locations. Where plums are grown on light land, or on a loamy or sandy soil, the preparation of Paris green and water, sprayed several times in the spring, will keep the curculio away. The old custom was to shake or jar the trees, but the application of Paris green has been so effectual that I have had to thin the fruit out to prevent too much from setting.

MR. SEARLE. What is the nature of black-knot?

MR. POWELL. It is a fungoid difficulty and is not caused by an insect; many cutting down into the knot find an insect and at once come to the conclusion that this insect is the cause of the disease, whereas, it is the effect and not the cause; the knot forms a good place in which the insect may deposit its egg and it does so. The only remedy that I know for black-knot is to cut it out with a sharp knife.

Since being at your meeting at Gettysburg, I find that the black-knot has wiped out my entire plum orchard. The great plum crop that has yielded so many thousands of dollars, has been destroyed. In the midst of this trouble, I set out 1,000 plum trees, and have succeeded in getting four or five crops of plums, but my entire orchard has been ruined the past season. In the spring you could not find a spot larger than a ten-cent piece; now you could hardly put your finger upon a spot of sound bark of that size. Now, what was the reason of this? The trouble was that old trees were standing, and they inoculated the orchard by their fungoid spores, given off in the winter; in the spring, when the circulation started, these spores took root on all parts of the trees. Our experiment stations hope to find a remedy by spraying.

MR. SMITH. Some writers state that it is in the sap of the tree; what do you think of that theory?

MR. POWELL. I think that the theory is wrong; in my case, the trees were in good condition, and were well cultivated; I think that the trouble was communicated through the atmosphere and the conditions were all favorable for its dissemination and its propagation, taking root when the circulation of the tree begins.

I wish to impress upon you the importance of always being prepared to meet these and other difficulties as soon as they show themselves. In my own state this year, those who sprayed their grapes with the Bordeaux mixture have perfect fruit; had I not used it my crop would have been cut off at least 90 per cent. The result was that I did not lose 20 per cent., while many who did not spray lost the whole crop. On opposite sides of one road, one man saved 75 per cent. by spraying, while his neighbor on the other side lost his whole crop by not spraying.

MR. McDOWELL. How about poison on the grapes?

MR. POWELL. All that you read about that in the papers was a scare. The action of the New York State Board of Health was very hasty, and you need have no fears of poison from this remedy for grape diseases.

JUDGE STITZEL. Do you ever bag your grapes?

MR. POWELL. No, sir; I have never used bags; fungus troubles will attack the grapes inside of the bags. Spraying will prevent the troubles alluded to, and bagging is unnecessary. All spraying of grapes should be done in the spring and in the early part of July; it is useless to spray after the disease is upon the fruit.

I would like to say a few words in relation to apple culture. I have shipped fruit this season which has been netting me very satisfactory prices all along. I have been shipping Tompkins County Kings and Twenty Ounce apples, and I should think that upon such high land as this, there are many who might very profitably devote several acres each to the production of apples for shipment to Europe. I have here an apple which has been handed to me, and of which I do not know the name, as it is entirely new to me; such an apple as this would be an excellent shipper and would certainly command a high price, either in the home or European markets. Its quality will not develop for almost three months yet, and it will make an excellent shipping apple.

MR. SEARLE. Mr. Jaekel stated in his essay that two or three harrowings are enough for the strawberry; I cannot succeed in raising strawberries with that amount of tillage. Your ground must be kept free from weeds from the beginning of the fruit gathering until the end of the growing season. I think that Mr. Powell will bear me out in the theory that the great success in small fruit culture depends upon careful and clean culture and the fertility of the soil.

QUESTION. What is the cause of mildew on the grape?

MR. POWELL. Some kinds of grapes are much more susceptible to mildew than others; take the Delaware grape, also Brighton, for an example; its foliage is very sensitive and it is attacked with mildew when other varieties under the same conditions escape. Putting on a sulphur preparation at its very first appearance will prevent it. Sulphur, mixed with a little air-slaked lime, and applied with the bellows, will usually check it at the onset.

MR. SMITH. What will prevent the ravages of the currant worm?

MR. POWELL. The currant worm is very easily controlled if you attend it in time; a little white hellebore dusted over the affected plants is good; also Paris green; mix the hellebore with flour or plaster and apply it to the bushes carefully, and you should have no trouble with the worm. If you prefer it you can first spray with the Paris green

solution and then apply the hellebore, but I prefer the hellebore only for last application.

MR. HIESTER. Do these fungus growths, which are the cause of the black rot in grapes, develop from spores of the same year, or are they the spores of the previous year's production?

MR. POWELL. They come mainly from spores of last year's growth; it is not contagious from individual grapes; it is in the soil and on the old wood, and develops when conditions are favorable. It is good policy in gardens to rake the soil over well and burn leaves and vines, for in this way you destroy large numbers of spores. It is lurking in our vineyards this year and next year they will cause us trouble.

QUESTION. What exposure do you think is the best?

MR. POWELL. For apples, I would choose a northwestern exposure; it prevents injury from early frosts and retards the ripening of the fruit somewhat. For grapes, I would select a southwestern exposure.

MR. McDOWELL. What is the best remedy for the peach borer?

MR. POWELL. To 40 gallons of lime water, add two quarts of lye, such as you can get from your ash barrels, and two quarts of coal or gas tar; stir in enough fresh cow manure to make a thick paste, and apply to the trunks of the trees not later than the middle of May; the lime and cow manure will form a kind of cement which prevents the moth from laying her eggs, and the odor of the coal or gas tar is offensive, and her instinct leads her to avoid it. The application should be made again about the last week in August.

ANOTHER YEAR'S EXPERIENCE WITH FRUITS.

BY PROF. S. B. HEIGES, *Small Fruit Culturist of the Board, York, Pa.*

I have no essay prepared. I would much rather speak extemporaneously than prepare a paper, because it seems more practical, and there will be no interruptions by your asking questions.

This Board did me the honor to make me the Small Fruit Culturist of its organization. I have been connected with the Pennsylvania Fruit Growers' Society, now the State Horticultural Society, have been honored by having been its president and secretary, and connected therewith for about 30 years. I also raise the large fruits, such as apples, prunes, pears, cherries, almonds, plums, nectarines, apricots, etc.

I desire to call the attention of this Board to the fact that the time has come, on account of the changing of the atmosphere, brought about by the denuding of forests, and it now stares us in the face, that in order to raise fruit successfully we must resort to spraying, and I shall speak more largely of that and the small fruits. I have used all the formulae sent out by the United States Government, representing the Fruit Department, and the various experimental stations of our Agricultural Colleges, and I find the one that is reported in the last report of the State Board of Agriculture, formula No. 6, answers every

purpose for the destruction of insects and fungi. My experience this year corroborates what I stated last year. I find this remedy not only destructive to the insect pests which are injurious to fruits, but to all the fungi and germs except that disease called the peach yellows.

I hope some means will yet be discovered by which that pest may be put under control. A few weeks ago I noticed on my apple trees (I have 14 experimental trees) a disease somewhat similar to the fire blight that affected our pear trees; a sudden blackening of the foliage, especially upon the young growth of the present season. In the course of 24 hours the young wood became as black as coal. Of these 14 trees, the following varieties have been attacked, and I doubt not that other varieties will be during the season: Nickajack, Benoni, Cornell's Fancy, Smokehouse, Red Astrachan, Duchess of Oldenburg, these were the six varieties. I have applied spraying to these trees, which has arrested the development of the disease, but they will be required to be pruned in course of time.

I have brought here samples of gooseberries. I have Crown Bob, White Smith, Industry, Downing, Houghton's Seedling, Mountain Seedling, Smith's Improved and the Triumph, and I have made a fair test of the No. 6 insecticide and fungicide, and also of No. 7. No. 7, you recollect, was highly recommended by the chemist of the experimental station of the New York Agricultural College. No. 7 may be new to you; it is for gooseberries only, and is one-half ounce of sulphide of potassium, dissolved in one gallon of water. I have made three applications of No. 6 and of No. 7, using each upon the same number of bushes, when the buds were bursting, one after the fruit had cleared itself of the blossom, and the other about ten days ago, and I would defy anyone to discover any mildew on them; and I say it is just as easy to raise gooseberries, one of the most profitable berries, by the use of No. 6 or No. 7,—which bring 10 cents a box—as to raise Canada thistles, ox-eye daisy or wild carrot, found on many of our farms—just as easy. This (indicating) is a branch of the Mountain seedling, of which the fruit formerly dropped before I applied spraying.

MR. SEARLE. How do you manage the worm?

PROF. HEIGES. I use No. 6 for all fruits, and I have found it useless to use No. 7. This is a sample and I will be glad to subject it to anyone who knows anything about the gooseberry and currant. That (indicating) is a sample of our best American gooseberry, the Triumph, superior to the finest English gooseberries. Here (indicating) I have a few of the Crown Bob, one of the largest English gooseberries. Ordinarily my fruit would drop after having been attacked. I have neighbors living on either side of me (my small fruit orchard is 100 feet in width and 200 feet in depth), and I cannot induce either one to use insecticides or fungicides, and I found their fruit covered with mildew about the thickness of the furze on the peach.

MR. COOPER. When do you spray, or when do you apply it the first time?

PROF. HEIGES. When the buds burst; the second time when the blossoms fall off, and the last time about 10 days ago. If I should see any indication of mildew or blight, I should give them the fourth application. The gooseberry can be thoroughly disinfected at the rate of 15 or 20 cents per hundred bushes and with very little labor.

Now, for the first time, I have referred to the fire blight on the apple tree, and I hope the members of this Board, when they go home, will

examine their young trees. It is among the young trees; I have not found it among the older trees. A good fungicide will neutralize this.

MR. COOPER. Have you used the fungicide in spraying apples where the attack is now on?

PROF. HEIGES. I have where the limbs have been blighted; they are dead, and will be required to be pruned. I should have sprayed earlier in the season if the trees had been set with fruit.

I come here with a very sad story to relate this morning, and when you go home perhaps you will find the same condition of things to exist in various portions of Pennsylvania. There were promises of a large crop of fruit all through Pennsylvania. Our finest cherries have been destroyed by continuous wet weather. We have shipped as high as six hundred bushels of cherries in a night, but I do not believe there will be an aggregate of 600 boxes per night this year. The sun has not been seen for 10 days. It is almost impossible for the various forms of fungi to develop during periods of sunshine. I kept an account of the weather from the first day of January to the fifteenth day of May, and there were but 17 days during that time in which the sun shone. All you who have not kept a record will be surprised to hear this; and this has been a season in which the various forms of fungi have been multiplied in countless millions, and this, no doubt, has been the cause of the failure. We are in a cherry section of Pennsylvania, and yet this is the fact.

As is known to all fruit growers, there was a very superior setting of fruit. The trees would have overborne; but, during this wet spell, the change of atmospheric conditions caused a change of the stem from green to yellow. There was a great promise of an apple crop, but nearly all have dropped. Last year I had 40 bushels of pears; this year I will be glad to have four bushels. There is but one crop that we will have in southern Pennsylvania that will be a paying one, and that is the peach crop.

I want to repeat again, that if I was cultivating the small fruits for sale, and wanted to plant blackberries, I would select the Early Harvest and the Erie blackberry; these years of experience corroborate what I have said heretofore. I look upon them as the best varieties; they are iron clad, they are as hardy as the Snyder and the fruit is a great deal better. I have not heard of a single instance in which they were attacked by anthracnose.

For this year I want to add to the list of raspberries that I gave last year. I gave last year the Cuthbert as the best red, the Golden Queen as the best yellow raspberry, and the Gregg as the best black-cap. Add to the red list the Marlborough; it is not as rank a grower as the Cuthbert, but is hardier and the fruit is larger. I want to add to the black-cap, the Ohio.

I have had about 23 varieties of strawberries, and I want to give you the benefit of my experience in testing these varieties. You know there is no other fruit that is so modified by position, by location, and by the quality of the soil as the strawberry. It will grow where other fruits will grow, as far north as man has gone and as far south as man goes. It is the universal berry; it is God's fruit. "God might have made a better berry than the strawberry, but he did not." Of all these varieties (you may have tried some of them) I have three to recommend. One of these is Lovett's Early. My favorite early

strawberries, prior to this year, were May Queen and Michael's Early. The strawberries this year were about a week later than other years, owing to the want of sunshine. I picked Lovett's Early for family use on the 28th day of May, and when I exhibited these to some of the fruit-growers around York, they said, "You got them from Baltimore." All I said was, "Look at the green stem, and that will convince you." On Decoration Day there was a friend who went on my patch, and when he met me down street he told me, "I am satisfied that Lovett's is the best early strawberry, and I want you to save me some of the plants." The Eureka is, with me, the best middle season berry. For a late berry, I would advise Gandy's Prize.

I don't know that I have anything else to say.

SENATOR CRITCHFIELD. Do these varieties all fertilize themselves?

PROF. HEIGES. Yes, sir; excepting the Eureka, they do.

MR. McDOWELL. How do they compare with the Sharpless?

PROF. HEIGES. There is no other berry that can compare with the Sharpless—I am speaking of these new varieties. All these berries have been subjected to the same treatment.

MR. HOPWOOD. How about the Jessie?

PROF. HEIGES. It is not as good as the Sharpless; it is a cross between the Sharpless and the Crescent. The only objection to the Sharpless is the white tip; that white tip is just as sweet as any other portion of the berry.

MR. HOPWOOD. Isn't it larger? I have them as large as hulled walnuts.

PROF. HEIGES. I have had 18 Sharpless berries that filled a box.

MR. COOPER. What was the size of the box?

PROF. HEIGES. The box that is used by all fruit dealers—32 boxes to a crate—18 completely filled a box.

MR. LAWSON. Have you tested the Triumph of Cumberland?

PROF. HEIGES. Yes, sir; It is a seedling of Pennsylvania, brought out by Mr. Miller, of Cumberland county. It does not have the spicy flavor of the wild strawberry, and it is an off color.

MR. HOPWOOD. Is the Lovett's Early a productive berry?

PROF. HEIGES. Yes, sir; just as productive as the standards. I am speaking of the newly tried varieties. Lovett's Early is the best early berry, Eureka the best middle season berry, and Gandy's Prize is the best late berry.

MR. EVANS. Would it be of any advantage in spraying apple trees, to spray them at this time, where we wish to save the fruit?

PROF. HEIGES. No, sir; because they have been already stung by the codling moth.

MR. EVES. I was looking at my apples a few days ago, at Smith's Cider apple especially, and I made up my mind to spray them over.

PROF. HEIGES. It would be no use at all, but to arrest the ravage of fungi.

QUESTION. Are you trying any experiments as to value of Paris green in fungicides?

PROF. HEIGES. Yes, sir; this No. 6 consists of two pounds of copper sulphate, dissolved in two gallons of hot water; slake six pounds of stone lime in six gallons of cold water. When cold, mix; add one-quarter pound Paris green, one pint aqua ammonia and water sufficient to make 52 gallons.

Secretary E. B. Engle, of the Horticultural Society, received his monthly report from Washington in which it was recommended to increase, in the Bordeaux mixture, the water from 22 gallons to 40 gallons. I have used this year 104 gallons in formula No. 6, and find 104 gallons are just as effective as 52 gallons. It requires but a mere speck of the sulphate of copper. We have been using these mixtures too strong heretofore; especially is it true on our potato fields. Take the last formula that I have given you, and add sufficient water to make 104 gallons and apply that to potatoes, and use it as an insecticide and fungicide.

MR. MUSSER. How will that act with the squash bugs?

PROF. HEIGES. As to the trouble with the squash bug and squash beetle or flea, the latter is a little flea just about the size of a speck of dust; they may attack all the plants of the cucumber family, the watermelon, the citron, squash, etc., on the lower side of the leaf, and in applying insecticides or fungicides, you don't reach them. I found nothing so effective as taking plaster of Paris and mixing it with turpentine and putting it upon the ground beneath the foliage, not touching the foliage; that will drive them away. I have used this insecticide, No. 6, upon my roses and flowering plants, and also kerosene emulsion, but there is nothing better than Epsom salts. I found it to be the best application; it is composed of a tablespoonful of Epsom salts to a gallon of water; sprinkle it on the bushes for the rose bug.

MR. COOPER. I want to add a word to what Prof. Heiges has suggested in reference to the blight on apple trees. Five years ago our orchards, in the neighborhood where I live, were badly affected by it, just as was described by the Professor. The young growth was killed all over the tops of the trees, and we have had more or less since that time, not, however, so serious as this year. This year, to prevent that trouble and others, I used the Bordeaux mixture, half strength, when I sprayed for the codling moth, and added insecticide to it, and thus far I have seen no serious results and no blight on the twig.

PROF. HEIGES. You used 44 gallons instead of 22?

MR. COOPER. Yes, sir; it costs but a little, and is easily applied.

JUDGE STITZEL. First, in regard to early spraying, or the application of the sprayer: We spray our orchards quite early and we have not had the trouble that the gentleman refers to with his young trees; I have sprayed the young trees as well as the old. I believe in early spraying and believe that it will prevent what the Professor refers to.

MR. MCCracken. How early?

JUDGE STITZEL. Before the leaves make their appearance, and then to keep on according to the weather. After the application has been made for a day or two, the copper holds it so close to the branches that it don't wash out; if a rain follows the spraying, of course it will wash off more or less. Another way is to use Paris green; Paris green is a mineral, and sinks to the bottom, and when you use it you should use an agitator. We use an agitator when we use Paris green. The Paris green settles to the bottom and, as it gets shifted around in the wagon, it gets under the pump and it will pump more out than is beneficial to the trees; but, if you have an agitator, it will stir it up and it goes out more evenly.

PROF. HEIGES. This (taking up a branch of an apple tree sent for

his inspection) is known as a suctorial insect; it is called the green aphid. There are three colors; the black aphid, the white aphid, and the green aphid. It sucks the sap out of the leaves. Any fungicide applied to the lower side of the leaf will destroy them. That is the herd of insects that the ants live on. I have seen people put a collar of cotton around their fruit trees and saturate that with coal oil for the purpose of keeping the ants down. The black ant passes up and down the tree. You ought to tear off these collars and allow the ants to go up and feed upon them. The ant is the best friend you have in connection with this pest.

MR. MONAGHAN. When what we call the blight attacks the pear tree, how do you stop that?

PROF. HEIGES. By the use of sulphate of copper in spraying, or a modified form of spraying. Get under the trees and force the spray up under the leaves.

WHAT IS PRACTICAL DAIRYING?

By M. W. OLIVER, *Conneautville, Pa.*

(Read at Kittanning Meeting.)

I hold that whatever business we follow that is lawful, it is our duty to acquaint ourselves with the most practical way of managing that business, and then see that every part of the work is well done. The couplet "just as the twig is bent the tree is inclined," applies to the business life as well as to the moral. The fact that whole communities of farmers follow a certain practice, does not prove it the wisest or best; but often means that they were taught that way and have never tried any other.

To be successful, a man must understand the principles that govern his business. No doubt, one of the elements that has entered largely into the depressed condition of agriculture in the past, has been just this lack of education. By education, I mean that practical instruction that is brought to the very door of the farmers of our day. This instruction comes, in most cases, from men who have made a success of their calling, having, in most instances, come from the foot of the ladder, unaided, except as they have received ideas of a helpful nature from others who have preceded them. If the common farmer, especially the one who is engaged in dairying, will give heed to the instruction he is receiving, the result will be, he will find himself desirous of more light, more knowledge; hence, he will read more and investigate. These have been denominated "stepping stones" towards that higher ground the American farmer is sure to occupy in the near future. Give your children a good common school training, and, if possible, a higher education. At the same time, encourage them to remain on the farm by instructing them in the possibilities of their calling. Encourage them in obtaining a correct understanding of the nature and habits of farm animals; the structure, growth and feeding elements of plants. Teach them the day is dawning when the agricultur-

ist will be looked on as the peer of his fellows, for his calling demands the broadest intelligence.

In recent years, education has made no more rapid growth than among the agricultural classes. Take, for instance, the occupation of dairying. The day when the careless and easy-going man can succeed in this business has gone by, and the dairyman who would succeed must be awake, must be a thinker, must be a man of keen perception and of good judgment. The exigencies of the time demand these, and it is being met by the establishment of State Boards of Agriculture, dairy schools, special training in agriculture in some of our schools; and may we not hope to see, ere long, the elements of agriculture taught in all our public schools?

I have thus emphasized the necessity of a thorough training of ourselves for the vocation we choose to follow, for, it seems to me, that the average workman of any calling, in the future, can only look forward with the hope of obtaining a fair living, and quite often this hope may not materialize as he expected.

The practical dairyman must not only know how to do, but why. He must understand the principles which underlie his practice. He will understand the dairy cow, what she should be fed, and how she should be cared for; how the milk should be handled before he gets it, as well as how to handle it himself. He must understand, also, the chemical properties of milk and its products, and must have some knowledge of the science of bacteriology in its relations to milk, cream and butter-making. The dairymen who have knowledge of these things will make the high-selling butter of the future.

The demand is for better dairy cows. In every instance where the farmer has adopted better methods of farming, so that his land is becoming more fertile, he becomes discontented in keeping inferior stock. A less number of men are keeping cows about which they know nothing beyond the fact that they count so many. They have kept the cow, perhaps for the fancy they had for a certain shape, color or fashionable points, to the neglect of others relating immediately to the usefulness of the matured cow. Said a noted Kentucky breeder, not long ago, "I would not give a fig for a pedigree if the horse is not a performer." He would not undervalue pedigree, but he put a higher value on the record. Just so with the practical dairyman; he will give more for a cow with a high churn record than for a high scale of points.

In selecting the dairy cow, lineage is important. Not only so with the cows, but it is just as important in the case of the bull. We are told of the Persian bird Juftak, which has only one wing. On the wingless side the male bird has a hook and the female a ring. When thus fastened together, and only when fastened together, can they fly. The breeding for better dairy cows is that Persian bird, the Juftak. When the sire and dam each have an ancestry of large milk and butter records, then, and only then, may we expect to improve our dairy herd. That lineage which relates to performance in the dairy is more important, relatively, than lineage that relates to descent in certain lines of blood. I would rather choose a cow for the dairy, regarding which I was assured that her ancestors had been excellent performers at the pail for generations back, than one about whom I could only know that she had been purely bred.

But, after all, says one, " 'tis good feeding that makes the cow." Not so; but good feeding must go hand in hand with good breeding to make each a success.

Dairymen often make mistakes in feeding their cows. Not so much, perhaps, in the quality of the food given, as in the quantity to some of the animals. In a dairy made up of large, medium-sized and small cows, the dairyman seldom makes but little difference in the quantity of food given each cow. As a consequence, he tells us his small cows give him good returns, his medium cows fair returns, and his large cows—well, he is going to fatten them and sell to the butcher. Are you sure the fault is with the cow? It may be with yourself. Have you ever tried the experiment of feeding your cows according to their live weight? It is true, a cow weighing 1,600 pounds will not eat twice as much as a cow weighing half that amount, but she will require quite a per cent. more food, if you expect to get good returns from her.

It is an old saying that "goods well bought are half sold." My experience has been that a cow well-wintered is half-summered, is just as true as that one well-summered is half-wintered. I have found it poor economy to cease feeding a grain ration as soon as the cow goes dry. I believe it a positive fact that a cow will give more milk during the next summer if she has a small grain ration during her period of rest. The cow should be so fed during the winter that when spring comes, the animal is in good flesh and needs no extra food to restore the waste that has been going on in the system, through lack of nutrient food, earlier. She simply has to maintain herself. Nor do I believe a man can afford to have his cows go to the barn in the fall of the year in poor condition; it will cost too much to winter them. I make the assertion that the cow that will eat the most (if she can get it), from the first day of December to the first day of May, is the cow that comes from the pasture in poor condition. If you doubt it, try the experiment. Prof. Plumb, in his address before the Indiana State Dairy Association, stated that the average yield of butter from the milch cows of the state for 1890 was not over 90 pounds, which, at the average price of $12\frac{1}{2}$ cents, would make the income per cow \$11.25, or, with the skim milk and buttermilk, about \$15.00. Now, compare this with the Vermont farmer who made a record of 407 pounds of butter from each of his 20 cows last year; or with the 25,000 cows in Greene county, Wisconsin, from which 15,000,000 pounds of Limburg and Swiss cheese was made, which sold at an average of $10\frac{1}{2}$ cents per pound, or an average of \$65.00 per cow, and this in a season of six months. Here you see the advantage of good breeding and feeding. We do not believe the Vermont or Wisconsin cows stood humped-up all day by the side of a fodder stack, as Prof. Plumb says they have to do up in Indiana.

Another important point to be observed is regularity in feeding and milking. One writer has said that "every animal, somewhere in its make-up, has one of the most correct and reliable timepieces to be found." This is verified by the calf in the barn, or the pig in the pen, which has been having its food at a certain hour. See how soon it begins to squeal or bawl, to let you know that feeding time has come, should you let the hour go by. When fed what is wanted, it lies down contented, and grows, instead of being uneasy and worrying away

what food it has had. The loss in milking at any time when it best suits you, is far more than you are apt to suppose. Not only is there a loss in the quantity, but also in the quality of the milk. When milk is allowed to remain in the udder too long, it becomes feverish; it must certainly affect the butter or cheese. Everyone will admit that the more quiet an animal is kept, the better will be its condition. It takes more food to keep the nervous horse in condition than it does the more quiet one. I have seen cows let go so long without being milked that when the milkman went into the yard to milk, follow him around, as much as to say, please milk me first. Such cows use up a portion of their food and strength just by being uneasy, and loss comes in our getting less milk and of an inferior quality.

The more I study and try to practice economy, the more convinced am I that the farmer should so plan his work as to have all done at a specified time, the same as in a bank.

Until within a few years, dairying was almost wholly carried on in the summer, but of late years many are practicing winter dairying; and now, we are very often asked which is the more profitable. It is a question more easy to ask than to answer. I am fully satisfied, in my own mind, that in five cases out of every six, of the dairymen in this State, and other states adjoining, with their present facilities for dairying, the summer months will give them the most profit. There are so many barns unfit even to house dry cows in, much less cows in milk. Then, there are so many who have a prejudice against milking in winter; besides, it costs too much, they say, to grain the cows to make it profitable. But to the dairyman who has comfortable barns to house his cows in, and who is not willing to farm it on the wood-chuck plan of hibernation, I believe he can make winter dairying the more profitable.

My own experience is that a cow will give from 500 to 1,000 pounds more milk if she drops her calf in October than in March, or fore part of April. About the time the winter milker would begin to shrink in her milk, grasses come on and she will continue to give almost as much as the cow fresh in milk.

The question that is being freely discussed in many sections is: Which is the more profitable, the creamery or private dairy? Much may be said on both sides and no rule can be laid down that will fit every case. One thing is certain; better butter can be made by the private dairyman, who has control of all the conditions essential to good butter-making. But, butter-making, on most farms, is made a matter of secondary importance. The care of the milk and cream, also the work of churning, is put off until everything else is out of the way. By that time the work of decomposition has begun and loss is rapidly following. Cream is no respecter of man, or woman either. In the first place, a proper place must be provided where the milk and cream can be kept at the right temperature until ready to churn. The churning must be done at the time when the cream is just right. The maker must have skill to properly handle the butter, and a knowledge of what the market wants, and a willingness to put his knowledge in practice, no matter what his tastes may be. If the above conditions are to be complied with, some one must make it their business. If this person can be secured without too great cost, and if you are within reach of a good market, no doubt a greater income will be realized than from a creamery. In so few instances

are these conditions fulfilled, that the market is overstocked with a second and third quality of butter, some of which sells for grease only. If the dairy is small, the amount of the product will hardly warrant the outlay for appliances and help.

We find, here and there, a few who are opposed to the creamery. You cannot convince them that were the creameries to go out of existence, the manufacture of oleomargarine would be doubled many times. What the dairyman needs is a greater consumption to maintain and stimulate prices, and creamery butter has done a great deal to increase consumption, because it has decreased the production of bad butter.

The great advancement made in butter-making is largely the outcome of concentrated thought and co-operation in devising the best ways and means of manufacturing and management. Nor have we yet attained perfection. Onward should still be our aim. Constant vigilance is necessary. If every dairyman should feel that upon him a certain degree of success depends, there will be an united effort which will insure the highest results. The most hopeful sign of growing progress among dairymen is our growing intelligence. Farmers are comparing notes in regard to care and feed of stock, and calling upon the experiment stations and agricultural schools as never before.

PUBLIC ROADS.

By A. R. GREIR, *Birmingham, Penna.*

(Read at the Annual Meeting.)

We have been working in Blair and Huntingdon counties on this road question, and trying to make a start in some way, that the future may bring forth something in which we can better the roads of our own State, and in a very few words, I will consider somewhat the condition of the roads of this country, especially Pennsylvania, and somewhat throughout the other states at the present time, and consider what is the cause of it, and what is the remedy. Also, the condition of public roads throughout some foreign countries, and from what arose good roads, how they keep them in good repair, and whether we can apply the same remedy to our own country and State in having good roads. In the first place, I believe the farmer is the most interested man in the road question; that the farmer is losing more by the present condition of the roads of the State of Pennsylvania than any other set of men. We don't doubt that all are equally interested, because I don't care whether you live in the town or country, the betterment of the public roads is just as much of importance to you as they are to any other men. According to the census of 1880, the farmer had about four hundred million invested in farming implements, and your success in connection with implements and horses depends upon the condition that you leave the roads in over which you travel, and if you leave them in bad condition, it is working against you and costing you money. If the roads and wagons make one element to be considered, are the roads of Pennsyl-

vania in condition, at the present time, to make it profitable to go in the business of running wagons on the roads in any line of business, if the roads can be bettered? Down in Chester county, about two years ago, it was sometime in the spring, about March, there was a farmer hauling grain, the roads were so deep that he was compelled to hitch six horses in a wagon, where he should have had only two horses, and in some way one of his leaders slipped and fell; it happened to be a muddy hole, and it became entombed in the water and drowned itself. It is a disgrace and shame that there should be such a condition of things in Chester county. Now, if you go right over the State line, and go up into the state of New York. (I bring this up by way of comparison), you will find an elegant capitol building; there is a twenty-five million building, and, by the way, they are working on the road question harder than we are, and Senator Richardson, who is a farmer, (and there is no question but that he is a good one, for he was re-elected this year by an increased majority), introduced into the Senate of New York what is called the Richardson bill, which provides for three commissioners to be appointed, or elected, that will have control of all the public roads in the state of New York; letting out the contracts, and borrowing the sum of ten million dollars, and putting that on the public roads, and making them better for future generations.

Just as soon as the farmer is ready for good roads throughout the State, they are bound to come; because I believe these politicians are more afraid of the farmer than any other class of men in the State. You will have to demand it, and make your influence felt, and give them to understand that if they do not do anything for you, you won't do anything for them. While they were working on that bill, the farmers telegraphed to Albany to say to their representatives, from the different counties, that they would like to postpone bill so and so, which was this Richardson bill; that they were opposed to it; that they could not get in on account of bad roads, and they were opposed to the bill and asked to have it deferred for a few days, until the roads would dry up. I have a pamphlet, by Isaac B. Potter, of New York, and he gives the day and date of the condition of those roads, when they asked the postponement of that bill. There is one thing that you are bound to be in partnership with, that is, as a State matter. Our State taxes are collected from corporations, and from us throughout the Commonwealth. Supposing that any of the gentlemen, from any of the larger counties of the State, where they had ten thousand horses—there are about one hundred and sixty thousand horses and mules in the State of Pennsylvania; the average, I believe, is about twenty-five cents a day as the cost of keeping—supposing there were ten thousand horses in that county, and they would say: "Here we would like to make a contract with you to do the hauling throughout this county." We would like to make this proposition to you, that we will do all your work on the road, requiring ten thousand horses, and take off this trouble from you, by you paying us so much. They would say they would commence, and that they would have to have ten thousand horses, and five thousand wagons, and so many harness, and this and that; and all the appliances that would come in, to do that work; and they would fix the basis of price, taking into consideration the condition of the roads.

If there is a man here who says they have not bad roads in their county, I would like to see him. You will find that in Chester county they have been building some good roads, and they have been taking the lead. Do you suppose that any money can be made in this employment, in the present condition of the roads? Because, sometimes, when they start in, the roads are hard, and they can haul a ton, and then suddenly they become soft, and they cannot haul more than half as much through the mire. If this is the condition of the roads of Pennsylvania—and there is no doubt about it—is there any place that they have any better roads? I will ask you to go with me for a few moments across the sea, and see what they do there. I understand through the papers, and some farmer friends, and it is the general complaint that we hear most about, that the farming business does not pay; that there is a vast difference between the profits of farming and the business of merchandising. Is this true? Reports from twenty European countries have shown that this difference in the business of farming does not exist, to the same extent, that you find it in this country; that the farmer is as prosperous there as the merchant; that he prospers there as people do in other lines of business. What is the greatest difference, I ask you, between the conditions in France, if I can take that specially, and the condition here? The greatest difference is, between the two countries, in the condition of the roads. They used in England, and used to have in France, the same system that we have in this country, in working out our taxes in this State; that each county and each township was compelled to take care of its own roads. What was the consequence? I cite you to England in reference to that. The men to whom the great credit was due, and is due, for the good roads of England, were MacAdam and Telford. It was from about 1820, to 1830, that the road question was agitated. They commenced to complain, and these two brilliant men came to the fore front with their splendid ideas, as to the improvement of the roads. They differed somewhat in the building of the roads, but they both can build the best roads in the world. There is just this difference in their method. Telford puts a broad stone at the bottom, while MacAdam builds up with the smaller stone. That is a subject for a practical civil engineer, who has made a study of it for years. These men commenced to agitate this question. In order to get some light on this subject, I wrote to Isaac B. Potter, and I asked him something about the matter; whether there was any other way, or any other scheme, had ever been successful, that did not throw the burden of the main roads on the State. He answered something like this: If you go to the Parliamentary Reports of England, about the time that MacAdam and Telford were helping them along there on the road question, you will find about the same opposition that we have had in this country. You will find farmers and others coming up and appearing before legislative committees with their opposition, and find about the same reasons given for the state taking charge of the roads; and I think, from all that I can find out, that he is the best author on that subject in this country. And he further said this: "There never has been a scheme proposed, except where the state has taken hold of it, and it was paid by the state, upheld by the state and controlled by the state, and the method of supervisors working out their taxes but money has been thrown away." There is one thing I want to mention. They have one hundred

and thirty thousand miles of roads in France alone. France is only about four times the size of the state of New York. It is costing France now eighteen million of dollars to keep up the roads that they have at the present time. There is another question that I had thrown at me once or twice before, and that is this. They will say here, that France is more thickly populated than this country; the farms are better cultivated, and contain more citizens; they can afford to build better roads. Why, you can't afford to build roads like that in this country. France is divided into eighty-seven departments, or counties you might call them. The population of New York, Pennsylvania, New Jersey, Connecticut, Rhode Island and Massachusetts, is more thickly concentrated than those eighty-seven. In that country there are not only good roads through the thickly populated parts, but through all parts. A chain is no stronger than its weakest link, and a road is no better than its poorest place in it, and, therefore, you have to build it equally good from one part to the other. Down in the state of New Jersey, in Union county, some three or four years ago, a lot of gentlemen got together and commenced thinking about this question, compared the valuations of their property, and looked for the cause of the decrease in the value of land throughout the country, and the farms surrounding the large towns, such as Plainfield, Rahway; and they came to the conclusion that the one thing that was decreasing the value of land in New Jersey, was because of the miserable condition of the roads they had there; and they could not be worse. I saw them a number of times before anything was done, and it was a common occurrence, when they drove up in the city of Elizabeth, to hitch a horse in the evening and haul the wagon out the next morning, and be compelled to dig it out. These gentlemen went together, and went to Trenton to ask for a general law, and were opposed by some in other parts of the state, but asked the privilege for the bonding of the county for one hundred and fifty thousand dollars. They went back to Union county, and built the most expensive road they could build. It cost them about ten thousand dollars a mile. They ran out of money, and went back to Trenton, and persisted, and got authority to borrow one hundred and fifty thousand dollars; and they raised the tax, and raised fifty thousand dollars of money, and from that they got from fifty or sixty miles of road; and they have the best road that there is in existence, of the Telford pattern. Mr. Thomas Nevins, a gentleman who lived near Elizabeth, in Union county, N. J., has come forward and said: "I owned a farm before this road improvement took place, and the best offer I ever had was from fifty to seventy-five dollars an acre. I was not a farmer myself, and I rented it. But I found out that it hardly paid the taxes; it yielded me nothing, and I could hardly make anything out of it. It was not long before I was offered \$200 an acre for the farm, and I found that it was because of good roads. I could also rent it with advantage, and it would pay me to hold on to it, and, therefore, I did not want to sell it." That is a wonderful increase.

There is no question you can take up here, that will be of greater importance, than the subject of the improvement of roads. There never has been a system of roads built that has not increased the lands from fifty to seventy-five per cent., other conditions being equal. If there is a place where there has been a good, solid system of roads put in, and this has not been the fact, I have not found it.

THE INFLUENCE OF TEMPERATURE ON THE SPECIFIC GRAVITY OF MILK.

By PROF. C. B. COCHRAN, *Microscopist of the Board, West Chester, Pa.*

Several years ago Dr. Vieth prepared a table, showing the effect of temperature on the specific gravity of milk. This table has been used extensively by milk inspectors, dairymen, and chemists, in making corrections for temperature in determination of specific gravity. It covered a range of temperature from 45 degrees F. to 70 degrees F., and included all milks having a gravity below 1034.

At the request of Mr. George Abbott, of Philadelphia, I undertook to extend this table down to a temperature of 40 degrees F., and also to extend the range in specific gravity up to 1.040.

My experiments soon showed that the effect of temperature on the specific gravity varied in different milks, depending in part, at least, on the percentage of fat contained therein. Although this fact was in accord with my expectations, and is probably known to others, yet so far as I am aware, no experiments showing this variation, have been brought to public notice.

The following are the results of my experiments, made for the purpose of finding the effect of temperature on specific gravity:

No. 1. Slightly Creamed Milk.		No. 2. Skimmed Milk.		No. 3. Watered Milk.	
Specific gravity.	Temperature.	Specific gravity.	Temperature.	Specific gravity.	Temperature.
1031.3	60°	1034.4	60°	1023.8	61°
1031.2	61°	1034.5	58°	1024.3	57°
1031.6	58°	1034.6	55°	1025.2	48°
1032	54°	1035.5	40°	1025.7	42°
1032.8	46°	1035.7	37°		
1033.2	43°				
1033.6	40°				

No. 4. Skimmed Milk.		No. 5. Whole Milk.		No. 6. Skimmed Milk.	
Specific gravity.	Temperature.	Specific gravity.	Temperature.	Specific gravity.	Temperature.
1031.6	85°	1033.5	61°	1033	90°
1032.8	78°	1033.6	60°	1033.8	84°
1033.7	71°	1033.8	59°	1035.2	74°
1035.3	60°	1034	58°	1037.1	62°
1035.4	54°	1035	50°	1037.3	61°
1036.5	43°	1035.8	40°	1037.5	58°
1036.7	38°			1038	52°
				1038.2	50°
				1039.1	40°

No. 7. Whole Milk.		No. 8. Skimmed Milk.		No. 9. Watered Skimmed Milk.		No. 10. Slightly Creamed Milk.	
Specific gravity.	Temperature.	Specific gravity.	Temperature.	Specific gravity.	Temperature.	Specific gravity.	Temperature.
1026.5	92°	1031.4	91°	1024.7	96°	1023.4	89°
1030.4	74°	1031.7	88°	1026.7	84°	1024.9	80°
1032	68°	1033.4	79°	1028	75°	1026	74°
1032.1	67°	1034.2	73°	1028.6	70°	1027.4	68°
1033.5	60°	1034.5	71°	1029.1	66°	1028.8	60°
1033.8	57°	1034.9	68°	1029.3	64°	1029.8	51°
1034.6	50°	1035.1	66°	1029.7	60°	1030.5	44°
1035.1	46°	1036	60°	1030	57°		
1035.6	42°	1036.1	59°	1030.8	48°		
		1036.5	56°	1031.1	45°		
		1036.8	52°				
		1037	50°				

In order to better see the effect of change of temperature below and above 60 degrees Fah., I have constructed the four following tables. Table No. 1 contains results for skim milks. Column I shows number of sample; column II, shows number of degrees the temperature was reduced below 60 degrees Fah.; column III, shows the resulting change in sp. gr.

Table No. II corresponds to No. I, but is for milk not skimmed.

Tables No. III and IV are for changes of temperature above 60 degrees Fah. Column II shows number of degrees the temperature was raised above 60 degrees Fah., and column III, resulting change in sp. gr.

TABLE I. Skimmed Milk.			TABLE II. Milk not Skimmed.			TABLE III. Skimmed Milk.			TABLE IV. Milk not Skimmed.		
I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
2	21°	1.5	1	20°	2.3	4	25°	3.7	7	33°	7
4	22°	1.4	3	19°	1.9	6	30°	4.4	10	29°	5.4
6	20°	1.7	5	20°	2.3	8	31°	5.6			
8	10°	1	7	18°	2.1	9	35°	5			
9	15°	1.4	10	16°	1.7						

No. 9 is the same as No. 8, with the addition of water.

From the results now given, I draw the following conclusions:

1st. For the same changes of temperature, different samples of milk do not necessarily show the same change in specific gravity, even though corresponding temperatures are chosen in each milk.

2d. For any given change in temperature, skimmed milks show a less variation in specific gravity than milks not skimmed.

3d. For any given number of degrees of change in temperature above 70 degrees F., the variation in specific gravity is greater than for a corresponding change in temperature below 70 degrees Fah.

This is probably the reason why Dr. Vieth did not carry his table above 70 degrees Fah.

4th. Since the variation in sp. gr. is not always the same in different milks, it is best, when possible, to take the sp. gr. of a sample of milk at 60 degrees F., and thus avoid any possible error which may arise from the correcting of the sp. gr. for temperature.

5th. Dr. Vieth's table for correcting specific gravity for temperature, is nearly as accurate as it is possible to make a table.

Dr. Vieth's table is not intended for skimmed milk, and for such milks a table somewhat more accurate might be constructed, especially for temperatures below 60 degrees F. For temperatures between 60 degrees and 70 degrees F., Dr. Vieth's table works well on skim milks.

A table is here added for correcting specific gravities of skimmed milk, for temperatures below 60 degrees F.

	40.	42.	44.	46.	48.	50.	52.	54.	56.	58.
1039	1037.4	1037.5	1037.6	1037.7	1037.9	1038.1	1038.2	1038.4	1038.6	1038.8
1038	1036.5	1036.6	1036.7	1036.8	1037	1037.2	1037.3	1037.4	1037.6	1037.8
1037	1035.6	1035.7	1035.8	1035.9	1036	1036.2	1036.3	1036.4	1036.6	1036.8
1036	1034.6	1034.7	1034.8	1034.9	1035	1035.2	1035.3	1035.4	1035.6	1035.8
1035	1033.7	1033.8	1033.9	1034	1034.2	1034.3	1034.4	1034.5	1034.7	1034.9
1034	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

DIRECTIONS FOR USE.

Find the temperature of the milk in the uppermost horizontal line, and the specific gravity in the first vertical column. In the same line with the latter, under the temperature, is given the corrected specific gravity.

THE UNEQUAL ASSESSMENT OF TAXES.

BY OLIVER D. SCHOCK, *Hamburg, Pa.*

(Read at Pine Grove Institute.)

The prevailing low prices for agricultural products, with their natural unhealthy attendants, such as loss of capital, decreasing farm values, etc., all combine to make the unusually prolonged period of agricultural depression, unfortunately, a reality rather than an imaginary evil.

A list of the alleged causes of this so-called agricultural depression would prove decidedly interesting reading, as every person has his or her own opinions about the causes that produced it, as well as to the remedies that should be applied.

It is not within the province of this brief essay to refer to more than a single one of the many mistaken causes to which farmers attribute their lack of prosperity. In these trying times it is, however,

necessary for the agriculturist to consider and pay attention to trifles and secondary matters in a way that has heretofore been unusual.

One of the many reasons given has been burdensome and unjust taxation. At the outstart, the writer desires to state that he believes in taxing all classes of real estate at its actual, bona fide, cash value, fully recognizing the fact that such a course would not increase, but, rather, more evenly equalize our share of the tax burden. The present system is one that should receive the earnest consideration of every taxpayer, because of the greatly varying taxes that are now assessed against properties of a similar kind in the same locality and county. The writer knows of a county where the system of valuation and taxation now in force revealed the following somewhat startling results: In the upper tier of townships, where the land was of an unproductive and non-supporting character, the real estate was assessed at its full cash value. In that section of the county, the total taxes assessed, including county, school, road and other local taxes, aggregated 48 mills, notwithstanding the fact that the valuations were, in some instances, considerably above what the properties would have brought at public sale. In the same county, in those townships that boasted of a superior quality of farm land, the assessors reported the real estate at about one-third of its actual value, while the total millage assessed for taxes did not exceed 18. Thus, in one section of the county, the property holders paid, proportionately, just eight times as much towards the support of the local government as his more fortunate neighbors. In another instance that came under the writer's observation, there appeared a wide discrepancy between the valuations that were placed upon adjoining farms in the same township, and which, generally, were supposed to be about of a similar value. While the valuation of the one farm was about one-third of its actual value, the other farm was assessed at its full market price. Upon asking for an explanation, those who were in authority stated that "it was always customary for them to assess non-resident property holders higher than those residing within the county."

A glaring case of neglected duty was presented in another instance, where a prominent citizen and leading real estate owner possessed a vast amount of valuable land. This was assessed at merely a nominal value per acre, "because," as an official stated, "in the first place, Mr. Office-holder owns a great amount of real estate, gives employment to a considerable number of people, yields a large amount of political influence, and so we really cannot afford to offend him by raising his valuations."

In numerous instances farm land that was contiguous to thriving cities and boroughs, was assessed at about \$100 to \$150 per acre, as farming land, while not a single acre was to be purchased under \$3,000. While the nominal value for farming purposes may not have exceeded the assessment, yet it was a well known fact that 25 times the amount of the assessed value had been refused by the fortunate, yea, doubly fortunate owner.

The most marked inequalities in assessing property are, in many cases, due to the willing or unwilling duplicity of assessors. In order to reveal the real character of the work of some of these entrusted officials, the writer would append the following statement, which is gleaned from a report on file in the office of the State Board of Agriculture, in connection with a large mass of other papers that relate to

the same subject. In this single township, the actual values and actual taxes vary from 6.46 mills to 13.33. The following table shows the returns from 19 farms from the township in question, the figures having been reduced to a mill rate for the purpose of a ready comparison.

No. 1,	6.46 mills.	No. 11,	8.95 mills.
No. 2,	10.13 "	No. 12,	10.27 "
No. 3,	7.04 "	No. 13,	10.14 "
No. 4,	7.80 "	No. 14,	7.79 "
No. 5,	7.51 "	No. 15,	7.40 "
No. 6,	7.96 "	No. 16,	12.00 "
No. 7,	7.81 "	No. 17,	11.00 "
No. 8,	13.33 "	No. 18,	7.89 "
No. 9,	9.50 "	No. 19,	9.43 "
No. 10,	8.00 "		

It is definitely stated that the valuations were obtained from actual sales, appraisements to settle up estates and equally reliable sources, and that the great difference in the valuations was due simply because of the mistaken or erroneous judgment of the assessor.

There is a decided difference in the pro rata of the assessments in the State of Pennsylvania. In but a very few of the 67 counties of the Commonwealth is any effort made to secure the correct and full valuation of real estate. In a number of the counties the commissioners requested the assessors to value all real estate in full, but a careful research and examination of the subject in the various counties has clearly proven that these instructions, though given in all earnestness and sincerity, have fallen far distant from their object. While it is true that in one or two instances the assessed value and the estimated actual value, as obtained from the best possible authorities, varied but little, yet, in the majority of the cases investigated, the margin was a wide one, indeed.

According to a report made at the annual convention of the county commissioners of the State, the ratio of assessed value, compared with the estimated actual value, is based upon something like the following ratio, viz:

Berks, two-thirds; Schuylkill, one-third; Lancaster, three-fourths; Lehigh, three-fourths; Northumberland, one-half; Luzerne, one-sixth; Carbon, one-half, and others varying from one-sixth to full value. In some of the counties the assessors are instructed to report all assessments at the full value, and the county commissioners' clerk will then make the usual reduction of one-third, one-half, or whatever the determination of the commissioners may be. The county millage also varies greatly, depending, in a measure, upon the wealth and resources of the county, as the financial requirements of the respective counties also vary very largely. For example, in one county where the property is assessed at one-fourth of its actual value, the county tax rate is 16 mills, while in another county where property is valued in full, the county rate last year was only one and one-half mills.

The writer has no desire whatever to create the idea that the taxes imposed upon real estate holders are unbearable. The principal

thought that prompted this essay was the fact that there is a lack of that progress in this matter that is necessary to secure a more uniform and equitable system of taxation. While we proclaim from ocean to ocean that "all men are equal," yet nearly every other citizen shares in an unequal allotment of the necessary burden of taxation. The largest share of our taxes are those imposed by the strictly local authorities, and if these are unreasonable and in excess of what they should be, the voter and taxpayer has a comparatively easy remedy within his grasp. The citizens of a township or borough should have a sufficient interest in the local government to see that only such persons will be elevated to a public trust whose past records as business men and prudent citizens will warrant confidence. Let the taxpayer seek the protection that he craves and, in most cases, his ambition will be realized. We decry parsimony, but demand just, equitable treatment. If the people's money must be spent, let those supervise that transaction who know best how to produce the most good for the community for the least possible outlay. Attention to this important matter will remove many of the evil defects of the present system which, only too frequently, considers political fitness, rather than business ability and integrity. The same rule will hold good in the township, borough, county and State government.

The Act of May 15, 1841, specifies very clearly that assessors shall value all property "according to the actual value thereof, and at such rates and prices for which the same would separately and bona fide sell." While it would be extremely unjust and unwise for a business man to charge one patron twice as much as another for the same article, yet the taxpayer has this experience with each succeeding year, and hardly ever thinks about taking time to enter his righteous protest.

It is this indifference that is responsible for much of the wrong that is being repeated with entire regularity. If the taxpayer will not take an interest in the solution of the difficult problem after the inequalities and inconsistencies have been made known and felt, there is no hope whatever for relief, either at the hands of the Legislature or local authorities. To permit anyone to do us injustice and wrong without entering our protest, is simply encouraging those who are the offenders to continue their wrong doing towards others as well as ourselves. As long as humanity is prone to err, the most equitable laws will be perverted, misconstrued or abused. With an enlightened citizenship, a growing spirit of righteousness, and a strong determination to succeed, the present evils can be mitigated, if not entirely removed. There is nothing to condone the present practice that will make one real estate owner pay twice the amount of tax that is assessed upon his property, compared with another farm that may be owned by a neighbor who, perhaps, wields a little more political influence.

The writer does not believe that the present tax system is responsible for the existence of the so-called hard times. If the farmer were entirely exempted from taxation there would not be any material change in the situation. Secretary Edge, of the State Board of Agriculture has proven that the average amount of tax paid in this State on a farm worth \$10,000 is not over \$95.00, and, in making this deduction, the most liberal allowance has been made in the matter of valuations. Taking the property at its bona fide cash value, the total taxes

would not exceed \$85.00 for a \$10,000 farm, as the average millage on farming property in Pennsylvania, based upon its estimated actual value, will not exceed eight and one-half mills.

The subject matter of this essay has thus far related solely to taxation as it affects the farming class. No special attention has been given to the relation that it bears to boroughs and cities, beyond the fact that the taxes under municipal government are considerably higher than those of the rural districts. Comparative statements show that city properties are taxed very considerably in excess of farming properties, and the writer believes that an examination of the records would show almost equally great differences in the work of assessors. That these discrepancies exist, none will dispute. If assessors would follow the golden rule and carry out the requirements incorporated into their official oaths, these wide, unreasonable and unfair divergencies would cease to exist.

THE FENCE LAWS OF PENNSYLVANIA.

BY HON. J. A. STRANAHAN, *Deputy Attorney General.*

(An Address at the Annual Meeting.)

When requested by your Secretary to address the State Board of Agriculture today, upon the question of the fence laws of the State of Pennsylvania, it was with some diffidence that I consented to do it, as I confessed at the time that, apart from my own experience in the western part of the State in legal practice in regard to the fence laws of the State, I apprehended some difficulty in preparing anything that would be of any practical benefit to this meeting.

In talking to you today, I am not certain but what it would be a great deal better for me and a great deal better for you if my remarks were confined to the answers of questions or suggestions of a practical character that would emanate from your own number, and I think, before I close, I will want a large part of my talk today to be of that character, in order to find out in what particular, or aspect, of the case, it touches you in different parts of the State. It will not be expected of me, and I do not propose to go into the question of local laws in the State of Pennsylvania. This I could not do if I would, because I have not the time, as the local laws of the State are so numerous.

I will confine my remarks this afternoon to three or four prominent aspects of the law in the State of Pennsylvania, and I will talk to you, first, with reference to the general laws of the State as regards fencing, so far as enclosing is concerned; second, relating to partition, line or division fences in the State; third, possibly touch on the question who are to fence private roads in the State, and, fourth, decisions of law where railroads go through a man's land. I propose to apply my remarks to this question, generally speaking, as general laws. Prior to 1700, the common law was the rule in the State of Pennsylvania, so far as fencing was concerned, and, under the common law, every

man had to keep his own cattle confined, and if he did not keep them confined and they broke through his enclosure and did any damage to the property of another, he was liable in an action of trespass—that was the common law rule, and it prevailed in this State up to 1700; and in 1700, we have what is called the general fence law, and I would like to read a portion of the first section of that law. The Act is entitled “An act for preventing all disputes and differences that may arise through the neglect or insufficiency of fences in this province, and counties annexed. Be it enacted, That all cornfields and grounds kept for inclosures within the said province and counties annexed, shall be well-fenced with fence at least five feet high, of sufficient rail or logs and close at the bottom, and whosoever not having their grounds enclosed with such sufficient fence as aforesaid, shall hurt, kill or do damage to any horse, kine, sheep, hogs or goats, of any other persons, by hunting or driving them out of or from the said grounds, shall be liable to make good all damages sustained thereby to the owner of the said cattle.” That is not the whole of the section, but all that is necessary to read at this time. In regard to the change made in the common law by the first section of the Act of 1700, that held in the State of Pennsylvania down to the year 1889, and, under that law of 1700, all damage that was done by reason of any cattle getting into lands of another, if there was not a fence of the character mentioned in that Act of Assembly, where it applied, there could be no recovery. Now, there was another Act passed in 1784, and that Act applied to certain counties—Bedford, Washington, Northumberland, Westmoreland and Fayette. That also regulated the character of fences to be built, and the subdivision of these counties into other counties carried that Act into a great many counties of the State down to the year 1862. So, if you take the Act of 1700 and the Act of 1784, they form what was the general fence law in the State of Pennsylvania, in all parts of the State, down to the year 1862 and the year 1889. In the year 1862, not exactly by the name nor the title in the Act of 1784, but sufficient to identify the Act by its date and title, that Act was repealed. The name of the county of Bedford was not mentioned in the repealing Act; it was left out, although it had been in the original Act, but I think it does not make any difference; the Act was repealed by its title and by its date, and it effected a general repeal of that Act, and it has been so adjudicated. I think two judges of the State of Pennsylvania have decided that the Act of 1784 was repealed in to-to by its title as well as by its date. One judge was Judge White, of Indiana county, and the other was Judge Mayer, of Clinton county. The Act of 1889 repealed the first section of the Act of 1700 and, therefore, I think, by my examination of the law, that today, in the State of Pennsylvania, there is no fence law; that is, I mean a general fence law as to the enclosure of a man's land, and, consequently, we come back to the old common law rule that existed prior to the Act of 1700; and therefore, the farmer, instead of fencing out his neighbor's cattle, has to fence in his own to prevent them from doing damage to anybody else, and his neighbor has to fence his in to prevent any damage to his neighbor, and I think the law is to fence in his own cattle, rather than to fence out the cattle of his neighbor. I think the original Act of 1700 and 1784 has been repealed in the State of Pennsylvania, and it is so held by at least three judges of the court of common pleas in the State of Pennsylvania—Judge White, Judge

Mayer and Judge Brown, of Warren county. I do not know that it has gone to the Supreme Court. These judges have held that we have no fence law as to the enclosure of a man's land, and that every man has to fence in his own cattle, and if he does not, and they get out and do damage to his neighbor, he must respond in damages.

D. H. PATTERSON, of Fulton. I understand you to say that the name of Bedford was omitted?

MR. STRANAHAN. Yes, sir.

MR. PATTERSON. Does that affect the status of Bedford county, or does it stand as the other counties in the State stand?

MR. STRANAHAN. I think it stands as the other counties in the State, for the reason that the Act was repealed by the title of the Act.

MR. PATTERSON. Does not the county of Mercer have the same law?

MR. STRANAHAN. Yes, sir.

GEORGE HOPWOOD, of Fayette. Do I understand that every man is absolutely bound to fence in his own property?

MR. STRANAHAN. No, sir; that is optional. I say that if his own cattle get out and do damage, he is responsible. The common law rule is that a man must keep his cattle within his own enclosure, or if they go out and do damage, he is liable.

R. E. MONAGHAN, of Chester. He has to fence in and not fence out?

MR. STRANAHAN. Yes, sir.

N. B. CRITCHFIELD, of Somerset. Suppose a man is driving a herd of cattle along the public highway and there are cornfields along that public highway; is he responsible for any damage his cattle may do?

MR. STRANAHAN. He will be responsible for any damage his cattle do, and I think he ought to be.

Now we come to the second proposition, which is not without some difficulty in the State of Pennsylvania, and that is, have the repealing Acts of 1862 and 1889 had any effect upon the question of line or division fences in the State of Pennsylvania? Now, there is a distinction between the general fences as to the enclosure of a man's property and the division fence between two persons' land. There always has been a legislative distinction there, and there always has been a legislative construction put upon that. We take the law today, and we think of it as the Act of 1842, where our township auditors are the viewers; and a great many of us go no further back than that, and we think that our division fences date from that time. From 1700 down to the present time, two distinctions have been made; one is general fences enclosing a person's land, and the other is a line fence enclosing his own land and that of his neighbor. This was the second section of 1700, and I think perhaps it will be news to a great many of you in regard to that Act having that clause in it. The repealing clause of the Act of 1889 only applies to the first section of the Act of 1700.

Let me read the second section to you: "And for the better ascertaining and regulating of partition fences, Be it further enacted, That where any neighbors shall improve lands adjacent to each other, or where any person shall enclose any land adjoining to another's land already fenced in, so that any part of the first person's fence becomes the partition fence between them, in both these cases the charge of such division fence, so far as enclosed on both sides, shall be equally borne and maintained by both parties. To which end, and the

others in this Act mentioned, each county court, within this province, shall nominate and is hereby empowered and required to nominate and appoint so many able and honest men as they shall think fit for each county, respectively, to view all such fence and fences, about which any difference may happen or arise; and that the aforesaid persons in each county, respectively, shall be the sole judges of the charge to be borne by the delinquent, or by both or either party, and of the sufficiency of all fences, whether partition fences or others, and where they judge any fence to be insufficient, they shall give notice thereof to the owners or possessors; and if any one of the said owners or possessors, upon request of the other, and due notice given by the said viewers, shall refuse to make or repair the said fence or fences, or to pay the moiety of the charge of any fence before made, being a division fence, within ten days after notice given, that then, upon proof thereof before two justices of the peace of the respective county, it shall be lawful for the said justices to order the person aggrieved and suffering thereby, to repair the said fence or fences, who shall be reimbursed his cost and charges from the person so refusing to make good the said partition fence or fences; and that the said costs and charges shall be levied upon the offender's goods and chattels by warrant from the said justice, by distress and sale thereof, the overplus, if any be, to be returned to the party offending." This Act dates very far back of 1842, and some of us never came in contact with it or knew it, and I refer this to you to show you that the legislative construction has been that it recognizes the two classes of fences, one governing enclosures and the other as to the division fence between lands of adjacent owners. You notice a distinction again here in this partition fence business, and that is, the partition is between adjacent improved lands; it does not apply to unimproved land. So that any of you who have land on which there is timber, or unimproved land, the Act of 1842 does not apply there. From my experience in these division fences, and it is not personal as much as professional, two persons may own adjacent lands; now, if it is improved and they wish to occupy up to the line between the parties and wish a division fence, they call in the Act of 1842, which has supplanted the Act of 1700, and, under the Act of 1842, we go in accordance with the method therein laid down through fence viewers, and so on, which, I suppose, is familiar to every one of you. Here are two farmers who own adjacent land and wish to occupy up to the same line; but they waive the statutory right, which is a common right, and they say, we wish to make a division fence on this line, and I will build one-half of it and maintain it, and my neighbor will build the other half and maintain it, and it is so done. And now that takes the place of the law, and each one is to build and maintain his own fence, and he is responsible, and always has been responsible, if he did not maintain his part, for any damage that might be occasioned by reason of his not doing it. Or, suppose they don't want to do it; then the law has always presumed they did not need it and were acting without that, and again were responsible for damages. Or, suppose there are two neighbors not getting along together and don't want a common fence, and one of them will build his fence six or eight feet on his line and the portion between the parties is thrown out in the common; it is not held to be improved land. The language of the Act of 1700, the second section, and the Act of 1842, you may say, are sim-

ilar. There are only two propositions; where they own improved land adjacent to it and if I build my fence within eight feet of the line, my neighbor cannot attach his fence to my fence; he is a trespasser if he does, and, consequently, you have two fences between two properties, each person having his own fence on his own land. I think the repeal of the law of 1700, and the repeal of the law of 1784, do not affect partition fences in the State of Pennsylvania; but one question does come up here: What kind of division fence is to be built? If the Act of 1700 and the Act of 1784 are repealed, each of which Acts prescribes a certain kind of fence, and the partition fence comes in to be fixed by the viewers, what kind of fence is it to be? I might say that there has been no adjudication of that question. There has been no judicial construction of the Act of 1700 and the Act of 1784; but I think that all persons who have examined the question will agree that the repeal of these Acts has not affected line fences. But line fences and general and division fences enclosing land, are two distinct questions.

B. K. JOHNSON, of Lehigh. Supposing that one farm adjoins the other, and we will say that this side is improved and the other unimproved or woodland, and the one that has the improved land there needs fencing; is the man on the other side, who has the unimproved land, compelled to build his fence in order to save the other man's crop?

MR. STRANAHAN. No, sir; it is between adjacent improved land owners.

D. H. PATTERSON, of Fulton. When the division fence is once established, can either party remove his without the consent of the other?

MR. STRANAHAN. No, sir; but he can build on his own land. That question has gone up and has been judicially decided, that I would have no right to take away a line fence or division fence between two parties, made common by long usage, by statute of limitations, or where it has been done by common consent of the two parties.

R. E. MONAGHAN, of Chester. Since the Act of 1889 repealed the first section of the Act of 1700, supposing a man owning 100 acres of land surrounded by fences on the adjoining land on the south side, and, under the Act of 1889, I conclude to throw open my land on the other side; have you examined to know whether I am compelled to keep up my division fence that was originally maintained?

MR. STRANAHAN. Yes, sir; it would be the line fence between you.

GEORGE HOPWOOD, of Fayette. There is a great deal of our land in our section bought up by the coal companies. Of course, it is improved land when they buy it; but, afterwards, they prefer to throw it out to the commons and force their neighbors to fence their entire property; can they do that?

MR. STRANAHAN. Yes, sir; they can throw it into the commons and make it unimproved land.

MR. MONAGHAN. Does that release him from keeping up his fences?

MR. STRANAHAN. Yes, sir; and I think it has received a legal construction.

D. W. LAWSON, of Armstrong. Supposing my neighbor and myself have established a line fence to fill the requirements of the law, and after while I am dissatisfied with that; I could not touch that, but I might build another fence on my own ground and leave that amount of ground thrown open to the commons?

MR. STRANAHAN. You have no right to any particular part of it.

MR. MONAGHAN. In the two decisions of Judge White and Judge Mayer, did not the question of line fences come up?

MR. STRANAHAN. No, sir; it did not come up; it did not come up in Warren county.

A GENTLEMAN. After twenty-one years, what becomes of the land, and whose land does it become? I mean that which is fenced out.

MR. STRANAHAN. A man does not lose his land by building his fences on his own land.

A GENTLEMAN. Has not the question been indirectly touched on by the Supreme Court as to the question of line fences?

MR. STRANAHAN. There have been different adjudications upon the matters arising between adjoining land owners on the question of fences, but not as to the repealing clauses in the Acts of 1862 and 1889.

N. B. CRITCHFIELD, of Somerset. I believe you said a man had a right to throw his land out and make it unimproved land. Suppose I should conclude that I did not want to raise any stock, and keep them all stabled that I have, and cultivate my land in the raising of crops; could my neighbor compel me to keep up my half of the original line fence?

MR. STRANAHAN. Yes, sir; up to the line.

SENATOR CRITCHFIELD. Then I might avoid that by leaving a strip there?

MR. STRANAHAN. Yes, sir.

N. SEANOR, of Indiana. Supposing a line fence should be torn down and either one of the parties would refuse to rebuild it, could he be compelled to renew that fence?

MR. STRANAHAN. Yes, sir; if he does not provide another.

MR. SEANOR. Another question I wish to ask, although it does not relate to this part of the discussion. The Senator asked about driving stock along the public highway; whether, if they went into the corn where there were no fences, damages could be sustained, and if there could be, could there be damages sustained to the parties going on the land to drive that stock off? Suppose I had sufficient help to drive that stock along the public road and the stock became unmanageable and ran into the corn field or grain field, and my man would go in there to take it away; I mean, could I be held for damages for the amount of corn I would tramp down in going after the cattle?

MR. STRANAHAN. I think the law would not regard the amount that you, in the line of your duty, would tramp down. I don't think that the law would regard that in the light of a trespass, but would take into consideration the damages done by your cattle. Of two parties, the one that is least to blame would not have to bear the burden.

S. MCCREARY, of Lawrence. Suppose here is a public road and I have three-quarters of a mile of fence along here, and I want to take away my fence, and my neighbor that adjoins wants to take his away;

here is the line fence, but when these two fences are taken away, what use is that line fence there?

MR. STRANAHAN. That is a question between you and your neighbor.

MR. MCCREARY. We have agreed to take that down, but here we come down here, and another man wants to leave his; have I a right to build that?

MR. STRANAHAN. If that is the common division line fence between you and your neighbor, and you occupy lands up to it, you have to do so.

MR. KENDALL. Say there is a farm and there was a division fence, and my neighbor opened a road just outside of the line; can he take his half of the fence away?

MR. STRANAHAN. Is that a private road?

MR. KENDALL. Yes, sir.

MR. STRANAHAN. If he were to make a private road between that line fence and he were to fence on the other side of the private road, he has that as his fence. If he throws that into road, it is not improved land, and the other side would not be a line fence between you.

MR. KENDALL. He can't compel you to remove it?

MR. STRANAHAN. No, sir; if it is a line fence.

L. GATES, of Venango. Suppose I take in a strip of land and leave my fence go down, and other stock comes on and goes on my neighbor's land, can he come to me for damages?

MR. STRANAHAN. No, sir; the law today is a fence around every man's land, and everybody's stock is liable, whoever is the owner of it. It is the owners of the stock that are responsible. Every man is to take care of his own stock. Neither the Act of 1842, nor the second section of the Act of 1700 refers to the good and sufficient fence. I think that the inference would be, if a construction would be put upon the Act of 1842, or the second section of the Act of 1700, because that is not repealed—it would possibly mean the fence that is in the first section of the Act of 1700. I think, upon that point, possibly, although I did not give any attention to it, that there might be some legislation which is needed. I want to state upon the third proposition, and that is suggested by a question: Suppose I am a farmer, and I live way back, off from the public road, and I want to get out to the public road and I petition court and I get a private road out; then the question is judicially settled; I think that I, the one for whom the private road is made, am responsible for the fences on either side, for building them and maintaining them.

Now then, comes another question, and that is, the fences through a man's land where a railroad goes through. I just wanted to touch on that, laying down the proposition where there is no special law in counties regulating that, that those damages, unless agreed to be paid by the railroad company at the time it was built, unless they especially agree, either in the written right of way you give, or whatever permission a farmer gives, if that is not secured in that way, the land owner would have to build and maintain his fences, or would be responsible for any trespass on the railroad. We sometimes think it is a great hardship if a person's cattle or horses get on the railroad track, and, if killed, we have no remedy; and, on the other hand, if a farmer's cow gets on the track, he having been bound to maintain it, unless he has required the railroad company to do it when they ac-

quire their right of way, damages could not be recovered for the loss of the cow, but the railroad company might recover damages from you for the whole train being thrown off the track. I notice an act introduced already as regards one of the western counties, Crawford county, I believe it is. The Erie and Pittsburg Railroad goes over the west side of that county, and another railroad goes through the southern part, and then another from Meadville across to Linesville; it is a thorough network of railroads in that county, as is also Mercer county, and yet the building of fences by these railroads has been provided for, first in the rights of way given by the owners when the railroad companies had their agents around adjudicating the question of damages for taking the property of another, fencing always being an item of damages, and I remember a great many cases that I have been concerned in where the number of rods of fences were estimated and the price proven what it was worth per rod. Here is an Act of Assembly introduced into the Senate requiring railroad companies in Crawford county to fence through lands. There is a decision in one of the later reports in a case from Warren county, in which the Supreme court has held that it is presumed that when the railroad company paid the damages to the land owner for occupying the land, unless it is particularly specified, the land owner is liable for the building and maintaining of the fences, and no recovery can be had under the law.

MR. MONAGHAN. In this State, in the absence of a contract, the land owner must fence his own land?

MR. STRANAHAN. Yes, sir; it is presumed, and the Supreme Court has laid down that rule, that the land owner is bound to build and maintain that fence. Therefore, it is not much of a question, if the land owners, whenever they give permission to others to go through their lands, whether by railroad lease, coal lease, oil lease, or mineral lease, that whatever rights he gives away, he ought to take care of himself at the time he executes the paper.

I have covered four points that generally cover the fence laws in the State.

H. M. ENGLE, of Lancaster. We have a line fence and my neighbor has a lane to drive through, and I made the line fence all the way through, although it is not occupied for farm purposes, but use it for teaming, hauling grain and taking his cattle to and fro; am I obliged to make that entire fence?

MR. STRANAHAN. Is it enclosed or open to the public?

MR. ENGLE. It is partly enclosed.

MR. STRANAHAN. If the land now is enclosed, if it is an enclosure, that is, at either end, so it is occupied by himself and not by the public at all, it would be classed as improved land. If he had that lane for his own private purpose, and fenced at either end, so the public had no use of it whatever, it might be held to be improved land, but if it were open so that the public could travel over it, then the question might arise whether it is not unimproved and owned by the public.

MR. BARNETT. Suppose the railroad comes through my land and takes away my land without my permission; in that case, would I be responsible in damages through failure to fence?

MR. STRANAHAN. Yes, sir; because it your lookout. You can get judgment for the land taken. The lower court would take care of the railroad company in this way—that it would permit them to present a

petition for a view with respect to damages, and in that question of damages it would be arranged. They could not take your land against your permission.

J. G. McSPARRAN, of Lancaster. In the building of a fence, can't I use just what material I see proper to use—barbed wire, or any other?

MR. STRANAHAN. Yes, sir; there is no legal restriction of the kind that can be put up, because there is no man that would put up a fence that would be endangering his own stock.

MR. CRITCHFIELD. Suppose I put up a barbed wire fence along the public highway, and somebody's stock runs away and is damaged; am I responsible?

MR. STRANAHAN. No, sir.

D. KISTLER, of Perry. If I have a lane, and have a gate in about five rods, or so, from the terminus of my corner, and maintain my fence in protecting his crops, and I leave them use that lane of mine, and they come through it; do they acquire a legitimate right to that by using it twenty-one years?

MR. STRANAHAN. That is a question of easement, which does not arise in this question under discussion today.

E. REEDER, of Bucks. Say a man had 300 acres of land, and, at his death, it was appraised so as to divide it among his heirs, and one heir would take 100 acres along the public road, and there was always a lane through that 100 acres. After partition of the land has been made, whose duty is it to keep up that fence.

MR. STRANAHAN. That is a question that ought to be taken care of in the allotment and partition proceedings; but, if there is a road there and partition proceedings are commenced, and the whole is described as real estate, and if one allotment or portion would go up to the outside of that lane, and so much was paid for that land and a valuation fixed upon it, you having to the fence and he having the other, and it allotted as real estate, I have an idea, between you and him, you would have no rights. That is a question that ought to be determined in the allotment or partition proceedings. But, if he took it and bid upon it and paid for it as land, up to that fence, he would own it.

J. C. SIBLEY, of Crawford. In relation to railroad fencing laws in New York, how does it come that it always occurs that the presumption is in favor of the farmer? The railroads there are compelled to maintain fences along their railroads, while here the presumption is always against the farmer and in favor of the railroad. The presumption of the court is always in favor of the railroad.

MR. STRANAHAN. If you take it in Pennsylvania, I think there is a reason in behalf of the railroad company. I will take it as if I was the railroad company, and I wanted to build a line through your land, or between any two places. What have I to do? I can't take your land without your permission; in no way can I get at it. We understand, in Pennsylvania, by our own laws, that the railroad company is responsible for all damages, and fencing is part of it. Now, I lay down the line, why should not the presumption be in my favor, that I have paid you for the fencing? You have a right to exact it before you give me permission to go on there.

MR. SIBLEY. If I sell you a piece of land, why should I maintain different relations with you as a corporation, from an individual? The railroad company is absolved when you buy from them, and the

onus of the whole matter comes upon me, and no man has ever received enough damages for right of way through his premises to pay him for the fencing.

MR. STRANAHAN. I might answer you that it is your own fault.

MR. SIBLEY. No, sir; it is not my own fault. Under a judicial tribunal they assess the damages.

MR. STRANAHAN. Yes, sir; if you are not satisfied, you bring your neighbors in and they put an estimate on it. That is, a jury of your peers put an estimate upon it.

S. F. BARBER, of Dauphin. Suppose you have land through which a small stream of water runs, and I have a water right; must I keep it fenced?

MR. STRANAHAN. If you get a water right and use it, I suppose you would have to keep up that fence. The trouble with you, farmers, is not because it is the fault of the law; it is your own negligence when you grant your rights away, in not having in your papers all these things protected; and ninety-nine one hundredths of the law suits in the State of Pennsylvania do not arise out of questions of law, but they arise out of questions of fact, and you people ought to settle all those questions of fact at home and not come to lawyers with them.

MR. DEWITT. How would you undertake to calculate the cost of building fences and maintaining them for a number of years, say for 20 or 25 years?

MR. STRANAHAN. That is a matter of mathematical calculation which I am not here to decide.

MR. DEWITT. I understand you to say, in the first place, that a railroad company cannot pass through a man's farm without that man's consent?

MR. STRANAHAN. Yes, sir.

MR. DEWITT. I know some railroads that have gone through a man's land up in Bradford county without their consent.

MR. STRANAHAN. It may be personal or legal. He may not give consent personally, but legally. I might use the word "right" in place of consent.

MR. DEWITT. I am here to represent the farmers of Pennsylvania, and I don't want you to say that railroads go through their farms with their consent.

MR. STRANAHAN. I don't mean personal consent, but I mean that they can't go through without their permission, either personal or by the laws of the State. I say they cannot take arbitrarily your land from you.

MR. DEWITT. Can you show me any law in the State of Pennsylvania that the Legislature has said that the cost of fencing has been taken into consideration?

MR. STRANAHAN. Yes, sir; I think I can find decision after decision on that point. In estimating damages the interruption of your water course is another right to be taken into consideration; the interruption of your way to a water course, the interruption of your way from your house to your barn is another. The law could not express all those points.

MR. DEWITT. There is not a particle of difference between a railroad and any other property right. They are laid out under the same right of eminent domain, when we come to split hairs about the fencing in the one instance and the fencing of the other.

I simply arose at the suggestion of some one, as to whether the farmers consented to these railroads going through their lands. As I understand, they do not consent in a public way, but because no man must set up his interest against the interests of the public.

MR. STRANAHAN. I would say this; of course I am not responsible for this, and in my talk today I take it just as it is in Pennsylvania, not as it ought to be, or as you men ought to have it, because it is in your own hands, and if you don't get it as you want it, don't blame anyone but yourself.

J. NICHOLS, of Westmoreland. The remedy, in my own case, was, when they wanted to go through my land with the pipe line, I said, I won't allow you to go through unless you file a bond to indemnify me, and they did so, and it was sufficient and we settled.

MR. STRANAHAN. I have had a great deal of experience at home, because our county is a mining county, and there are a great many leases prepared there for oil and coal and so on; and, whenever a farmer would come to me with a printed lease for anything, pipe line, ore lease or oil lease, I would not make use of it. I never saw a printed lease yet that I would advise a farmer to sign, and it is their own fault if they sign ignorantly. I know lawyers are necessary evils in a community, but a great many farmers, before they sign a paper, ought to understand the paper, or get some one to explain it to them.

C. EVES, of Columbia. If my neighbor's cattle cross my field or my fields and get on the railroad when I have no fence there, am I responsible for the damage that may accrue to the railroad company?

MR. STRANAHAN. No, sir.

A TALK ABOUT SEEDS.

BY THOMAS MEEHAN, *Botanist of the Board, Germantown, Pa.*

I have noticed, in reading horticultural and agricultural periodicals, and looking over programmes of associations and societies, how rarely anything seems to be said about seeds, and yet it is one of the most vital subjects connected with horticulture and agriculture that we can talk about. Instead of being a dry subject, there is probably more of vital interest relative to general information in connection with seeds, than perhaps in any other topic we could select. I thought, therefore, that some ten or fifteen minutes discussion may not be particularly out of the way.

Among the questions that strike me particularly in connection with the subject, is the question of the vitality of seeds; their vital power to resist those influences that tend to the destruction of life—for that is what we understand by vital power. The power to resist disintegration, to sustain life, and in that, particularly, it is an interesting topic. We frequently hear the inquiry about the long life of seeds, or the stories about the way very old seeds grow. Some persons have told us that they have seen seeds taken out of Egyptian mummies, after lying there three thousand years, and they planted

them and they grew. Those stories are floating around continually, and we are told frequently of other seeds being found in old chests and taken out, and which grew. Seeds were said to be taken out of old Indian mounds in the West, that were buried, just as the seeds of the Egyptian mummies, by the Indians, many hundreds of years ago, and they have grown. Then we hear of seeds dug up from old wells, dug deep in the ground, and the earth scattered on the face, and plants springing up that were not known to be found in the neighborhood before. We also hear frequently of cases where forests have been cut down, perhaps of pine, and the succession were oaks, or possibly some other trees of a kind that had not existed there before, and, consequently, these seeds must have been in the earth, waiting their turn to get a chance to grow. These are some of the accounts with which I have no doubt you are familiar, and which have excited your curiosity and interest many a time.

It does seem, after examining into these accounts, that some few are credible and others absolutely false. There is an immense amount of vitality in seeds, far more than even intelligent men are aware of, and which ought to be productive of practical results. Some of the wonderful accounts, as already hinted, are frauds. In the case of seeds in Egyptian mummies: It is well known that the people of the far east are not behind their fellow-men in the art of deception, and are living in such a state that they know very well how to act their part in order to make money. It is said they are so acute in the art of deceiving that they can make seeds fall out of the cloths around the mummies while you are looking at them, and by sleight of hand, they can make you believe that they came from where they tell you they came from, and for this they get large prices. That is the foundation for most of the stories concerning the peas and grains that are supposed to come from Egyptian mummies two or three thousand years old. The fact is that they are mere hoaxes.

In relation to the seeds found in our own mounds, they can often be explained by attributing them to be conveyed in modern times, by the operation of natural laws, with which we are not always well acquainted. It was only last year that a botanist in Milwaukee opened a mound in Wisconsin, and as the workers came on some pottery many feet under the surface of the earth, found a pottery vessel, with some kind of seeds in it that were unknown at the present time, and, in cutting them open, they appeared to be fresh. They were planted and they grew, the finder being an honorable gentleman, entirely above suspicion of fraud; it seemed like a genuine case of great vitality, that life could exist so long in seeds so many hundred years. With the pocket lens I saw at once that they were seeds of one of our common species of sedge grass, *Carex scoparia*. It was subsequently discovered that the whole mound was full of runs of the agricultural ant, a specie of ant which carry seeds many hundred feet to keep them during the winter. The whole explanation was very clear, that instead of these being old seeds, they were seeds which an agricultural ant had carried there and made these pieces of pottery-ware their granary, furnishing an illustration of many of the cases that we have heard of. Water birds will bring seeds with mud in their feet, and carry them in their feathers, and in that way seeds are brought to places where they were not known before. We know that in the seeds of pine and oak, they will not keep very long, and when they

sometimes grow in places where they have been unaccustomed to grow, all we can say is, it is hard to tell how they get there. But knowing their low vital power, we are sure these kinds were not in the ground. Some classes of seed have very high vital power, and some have very low. The very lowest order of plants, such as ferns and mosses and different species of mushrooms or fungi, have a wonderful vital power. If these were to be found in chambers or mounds, it would be a fair supposition that they had been there for centuries. Mushroom spores will stay in the ground for years and years, and grow when the exact condition required occurs. The plant is kept dry by those who make mushrooms a culture, in the condition of dug "bricks," and it is reported, by those who have done so, that they have had mushroom plants to keep fresh for twenty-five years. In the lower organism of plant life, their power to retain generating properties is greater than the higher, and indefinite is the question of the length of power to grow. In more highly organized plants it is very different. The common silver maple, producing seed now, will decay in six months, and no art of the grower is able to preserve it over one year. The same with the seeds of the horse chestnut, walnuts and other things; one or two years at most, is the period that they are able to retain vitality. Still, vital power depends to a great extent on the condition and circumstances under which the seeds are surrounded. A few years ago, a friend of mine had an idea that by keeping seeds and plants at a comparatively low temperature, they would live much longer than under the ordinary atmospheric changes from heat to cold and from moisture to dry air. He first tried it with young seedling trees, with ashes and maples, one or two years old. He put them in a cold storage house to keep them in the winter, so that they would not push out too soon in the spring of the year, and found he could keep them very well one year. The young trees were planted, and grew at the end of the first year; subsequently he found, in keeping them in this cold storage house, just above the freezing point, that they retained vitality, and were as good at the end of the second year as they were the first year, and that there seemed no limit to the time the plants might live under these conditions. So far his experiment was successful, and there he stopped; but it so happened that several hundred were left in a corner, forgotten, and were not discovered until six years after, and to his amazement, he found those trees were just as good as they were the first year; thus proving that when seeds and plants were kept at a low temperature, there was no trouble to retain vitality.

This discovery has been turned to good use in scientific researches. At one time there was a large sheet of ice from the North, which covered this whole eastern continent, and it was thought that all plants met in its progress were killed, except those that were enabled to ripen and mature as the climate got cold; when the ice receded, these plants were left on the mountain peaks. Today we find such Arctic plants on the mountain tops, along portions of the Allegheny mountains and on the Rocky mountains, and the theory is, that with the cool climate they flourished by seeding in advance of the ice as it came down, and when it melted, they were left there. But now, since this preservation of the seeds and plants is known to be secured by low temperature, it is believed that they remained under the ice for hundreds of years, and when it receded, the plants pushed up and

grew. During the expedition of Perry, some remarkable observations were made with reference to this vital power in plant life. One of the explorers in this expedition to Greenland, found a willow that was certainly many years old, having a woody trunk several inches thick, and many branches near the ground or underneath the ground. This willow plant was within a quarter of a mile of a glacier, and as that glacier covered the earth on which that willow was growing for centuries, there was no question but that the willow had retained its life under the ice all that time. This has been found to be the case with seeds as well as with plants; and the fact being well ascertained, we can understand that there may be in the earth, seeds keeping fresh for a long time, which, when brought to the surface, might grow, though no doubt their bringing, by birds or winds, may be as true as that the seeds have been in the earth a long time. I have seen myself, seed-plants come up that must have been buried ten years. When we get seeds, below the changes which occur at the surface of the earth, namely, cut off from atmospheric conditions, so that the atmosphere is low and uniform through the whole year, there is no reason why a large number of seeds may not live for a long time, just as well as though they were fresh-grown and fresh-gathered. The horticulturists and agriculturists will see, therefore, that it is not of so much importance to inquire whether the seed to sow is to be new or old; but a better thought would be to inquire how they have been kept or placed, whether they have been where it is dry today and saturated with moisture tomorrow—a summer atmosphere one day and winter the next, because it is under such conditions that vitality is lost. It is much more important to know whether the seed is good than whether it is old or new. Every one that is interested in getting good seed should have a pocket lens, and inspect the seed, to determine whether the vitality power is good, or whether it has lost its vital power. The seeds should be bright, ivory white; if there is the least discoloration, it shows that chemical changes have been going on. Such seeds are not good. Seeds require, each after its own kind, nice conditions in order to germinate. They all hate light, but love moisture. Some will only grow at a given temperature, and a few degrees above is as bad as degrees too low. Some seed will grow when the thermometer is 41 or 45 degrees, while they fail to germinate when the thermometer gets up to 60 degrees. This frequently accounts for seeds failing to grow. The summer temperature comes too soon. Hedge plants, fruit trees, such as apple and cherry trees, though perfectly fresh, often fail to grow, while the same is on the surface all the winter. The explanation of that is that these seeds require a considerable amount of low temperature. Every one has seen under old cherry trees, in the spring of the year, that stones sprout easily; the same planted often lay two years, and frequently three and four years, just according to the peculiar conditions before they grow. All seeds have their special conditions under which they will germinate. As we go up the mountains (I have no doubt Prof. Rothrock will tell you about that afterwards), one kind of tree will be found growing at 100 feet, one kind at 200 feet above the level, and then at 400 feet, 600 feet and so on, each zone will have its own kind of tree. As it is with trees, so it is with seeds; different conditions control them in their growth.

When we come to the practical conditions required in sowing seeds, we have to consider several points which influence their vital power.

Seeds never like to sprout in light; they have a horror of light. But they want air; hence we have to keep them as near the surface as we can, and get them just deep enough to hide the light from them. A number of kinds require artificial shade; but seed growers know that the nearer they can get them to the surface, provided light will not interfere, the easier they grow, and in that way the seeds get the moisture. In sowing seeds, never sow too deep, because depth is the preservative power; every one knows there is danger of rotting if they get too far below the surface; this comes from water without air. It has been found that in sowing seed the dryer the surface of the earth at the time the seeds are sown, the better the seed crop will be, provided there is the proper absorption of water by capillary attraction. I suppose those who have passed over a field, which has been ploughed and harrowed, will find that in going over and back again, their tracks moisten, and that is caused by the moisture being drawn up. Those who have had the best results in market gardening have found that sowing seeds along a line, and then tramping along the line, is excellent practice, capillary attraction furnishing the moisture; and it is so near the atmosphere that it cannot but grow.

I suppose my ten or twenty minutes, which is all the time I may talk about seeds, is about up. I think I have shown that the seed problem is not such a dry one, from the points thrown out; and that the points alluded to are of great value to the horticulturist and agriculturist, and are points by which they can all profit.

THE NECESSITY FOR A MORE GENERAL DAIRY EDUCATION.

BY HON. WM. D. HOARD, *Fl. Atkinson, Wisconsin.*

It is easy to criticise; to say this and that isn't right, but it takes practical, constructive thought to carry forward to success any enterprise we undertake.

Now we have an excess of organized dairy effort, in the shape of creamery and cheese factory enterprises. What we supremely need today is organized knowledge. A Yankee said about a man he didn't like, "He knows so much that ain't so."

Just so today among the great mass of farmers, east and west. There is a vast amount of erroneous ideas which hinder and discourage their progress in dairy work. The organized effort or labor, in the shape of the cheese factory or creamery, has come faster than organized thought and understanding, concerning the true economy of milk production.

A Pennsylvania or New York farmer will laugh at you if you intimate that he, born-on a farm, and subject to cows in the first person, singular, all the days of his life, but does not understand this animal sufficiently to make a success of her management. Yet the figures show, incontestably, that such is the case. Census, and other statistics, prove that there is not one Pennsylvania or New York farmer in ten,

who keep herds of ten or more cows, but who do so at a loss of profit, in half, at least, of the animals. The very exhaustive "Cow Census," of Ellisburg, N. Y., taken by "Hoard's Dairyman," in 1886, showed, that with a cow population of over 5,000, there was an annual loss of over \$25,000 to the farmers of that town. And it was one of the foremost dairy towns in that state. What caused this sad state of affairs? No lack of cheese factories and creameries, for they were there in abundance, but rather a lack of sound, intelligent, dairy understanding. They were running cows and farms on a lot of old, worn-out, threadbare notions about dairying that the modern, profit dollar refused to acknowledge obedience to. There was a sharp necessity for a change of methods. The annual loss told that. But there was not sufficient modern judgment, modern economy in feeding and the production of feed, to effect the change, and so the loss had been going on for years, and the farmers charging it blindly, meanwhile, to Western competition.

Many farmers, as they contemplate this agitation of the dairy and its economies, often express a fear that the business will be overdone. I have been a student of this business for thirty years, in all its phases, and I never yet saw the production of good, merchantable butter overdone. It is the poor goods; the product, too often, of stupidity and determined ignorance, that lies on the stomach of the market, undigested. I can find thousands of farmers in every state, who will deliberately lose a hundred, and in many instances, five hundred dollars a year, on blind and wasteful methods of dairy management, who would be shocked at the thought of spending fifteen dollars a year on their own dairy education. Yet that small outlay would soon save all the other loss.

The American farmer has been deluding himself, for a hundred years, with the old-time statement that he is a producer. He is not a producer. He is a manufacturer; and just as much amenable to the laws and adjustments of economy, in the expenditure of his forces, as an iron manufacturer. He must sell skilled, not blind, crude labor. There is but a very low market for crude, unskilled labor anywhere. Skill in dairy farming can only come from the use of knowledge—just as it comes to other men in other walks of life.

The business of dairying affords a fine field for the exercise of skill, and a good reward for it. Last summer I was in Northern Dakota, where the wheat fields stretched for miles beyond human vision. The gauge of value in every man's labor there, was just one single grade of wheat. No chance for any man to add a penny a bushel to the price, beyond the general grade. But a pound of fine butter carries with it the reward of fine skill. The ordinary product of stupidity is worth ten cents a pound, and a drug in the market at best. Fine butter is worth thirty cents. Twenty cents increase for brains, thought study, energy, ambition—in a word, skill.

The mind must be enlisted to make a good dairyman. Such a man must be teachable. Christ said, "Except ye become as little children, ye can in nowise enter the kingdom of Heaven." He could, with equal truth, have said that except ye become of equal teachableness—obedient to knowledge, ye can in nowise enter the kingdom of mathematics, of mechanics, of agriculture. The truth God has ordained, in the secrets of nature, must be sought out with earnest, discerning minds. The mind is master over the hand, and must lead the way.

Ten cent butter is the product of mere muscle, unthinking, hand work.

Do you want to measure your reward by that standard? Then seek for knowledge. Make of this dairy business an intellectual effort. Sanctify it with thought.

No business on earth demands intelligence in a greater degree than the successful management of the dairy cow. "Why?" you say. Because, only through intelligent methods can we reduce the necessary dairy expense to the possibility of profit.

It takes just as much expense in care, stabling and cost of the food of support, to maintain a cow that will yield only 150 pounds of butter a year, as it does one that will yield 300 pounds. Today, in Pennsylvania, the one hundred and fifty pound cow is the rule; the three hundred pound cow the exception. The latter is the reward of intelligence exercised in breeding, and a study of the laws that surround her care and management as a dairy cow.

In the Hoard creameries, five in number, near Fort Atkinson, Wisconsin, we have 360 patrons. In the home creamery are 100 patrons. To one of the patrons, a level-headed Scotchman, we paid, as the yearly earnings of his herd of forty cows, the sum of \$63 per cow, and returned to him, besides, the skim milk, for which we would have paid him \$12 per cow. So you see his cows were worth to him, as a reading, thinking, dairy student, \$75 per cow, in straight creamery work. To another patron we paid \$40 per cow, and his skim milk. The same creamery, the same neighborhood, soil, climate, water, air, and price for butter. The cost for keeping of the first herd was \$40 per cow, and the owner received \$35 net for his labor. The cost of keeping the second herd was \$32, and the owner received eight dollars in cash, and about six dollars worth of skim milk, as pay for his labor, per cow. One has \$35 and the other \$14. The fourteen dollar man worked just as hard, yea, harder. What kept him from the larger reward? He refused to be intelligent; he despised the idea that knowledge was necessary to profit.

An old German friend of mine had been to the county fair, with a fine two-year-old heifer, which he hoped would win a premium. He was leading her wearily back, disappointment showing in his steps and countenance, as he passed my office. I stepped to the door, and said: "Hello! Fieberger; did you get a premium on that heifer?" He stopped, and looking up, said: "You vant to know vat I dinks mit dis pizness?"

"Yes; what do you think?"

"Vell, if a man haf der beshtest heifer in der vorld over, ven he go py der county fair, und he haf not a goot head, den mine Gott in Himmel, he find he dond got a premium."

There is the principle for you. The old German said it. The heifer was a good one, but the owner did not use his head, and so lost the premium.

The patron whose cows earned \$75 a head, had built up his herd by intelligent effort. Commencing but a few years before, with a herd that he could not make exceed 150 pounds per cow; by seeking out the truth of such matters, he introduced improved blood, saved the best heifers and carefully bred them all the time, weeding out, until his herd reached over 300 pounds per cow. What produced the change? The growth of knowledge,

Farmers everywhere are turning their attention to dairy work, but not one in a hundred is asking himself the question, "Do I need more knowledge?" "Am I as well posted as I ought to be to succeed? What can I do to get better posted?"

They forget that dairying is a work governed by principles.

We must study the "why" and the "how." Old fashioned cow-keeping will land the best farmer in the world in debt. We are doing business differently than our fathers did. It costs us four times as much to live, and be a man of the same size, as it did them. We must have a larger revenue. Hence we must have better cows, better feed, better methods and a better understanding. Here we come again, right to the root of our difficulty—the need of more and better knowledge.

This leads me to say that the great and crying need among the farmers of America today, is not more politics, nor more parties, but more right, down-hard, intellectual head work. We need an intellectual awakening. We have grown dull and sordid, and gone off after the god of cheapness in everything, until we have put cheap thinking, cheap judgment, and cheap effort into our business everywhere. Of course, it has suffered. Nothing on earth could help it. Some day I hope the American farmer will come to his senses, and realize that his business needs as good brains and judgment and training and education, to run it, as any other in the land. The trouble starts right back in the farm home, in the estimate the father and mother place on the business before their children. The farm is not respected as it ought to be by the farmer, and his children see it, and so generation after generation of farmers have come along with too cheap an estimate of the character and importance of farming. This low estimate has driven all the talent off the farm, to the enrichment of other professions. Take this picture, a common one in every farm community: A farmer has three sons, William, Samuel and John. All three sound, bright sons. William wishes to become a lawyer; Samuel chooses to be a doctor, and John decides to be a farmer. Now, note well the training the father himself thinks those boys will need to make a strong success of themselves in their chosen avocations. To William and Samuel he says: "You boys must go to school at once. You must be educated and trained. Your minds must be stored with large, strong, intellectual conceptions, with the wisdom and knowledge of the men who have been great lawyers and doctors before you. I want you to be strong in your profession, and to be that, you must have strong, well-trained minds." If he does not utter these words, he shows that conviction by what he does for those boys, and the sacrifices he and the good mother will make in that direction. He shows that he clearly understands that the lawyer or doctor must learn how to hunt for principles in books; must learn how to know a principle when they meet it on the printed page, and then be able to go out into the tug and tumble of their business and put that principle into practical use. That requires intellectual force and training, and he provides it for the lawyer and doctor. But what about John? What is said and done for him? Well, about this in fact: "John, you are going to be a farmer like your father. You do not need a knowledge of books, because we cannot learn anything about farming in books, or on the printed page. All you need is a stout back and strong hands. Your business does not contain any principles, that can be

told in words, like law or medicine. There are no mysteries of chemistry or physiology. All the education you will need, is simply to read and write well, and learn how to figure well in accounts, so the smart ones will not beat you in a trade, etc."

And that is the way it has gone for generations. Do you wonder that with all this training away from, and against, farm intellectuality, that there is so little of it?

What a mistake! It is the farm intellect that has recruited every other vocation in existence. It is the parent intellect of our nation; in statesmanship, in law, in science, in everything. It is the farm that has earned the money to educate the great majority of every profession.

It is continually paying out money for every kind of education, but farm education. Oh! how wrong is this estimate, which the farmer puts upon his business. It is no great thing to be a lawyer or banker or merchant. All you are called upon to do in their work is to interpret and discern laws which men have made. But the farmer must interpret laws which God has made. Does it not require a deeper judgment, a better trained intellect and a more careful education to successfully interpret God's laws than those of men?

We need more dairy education, in order to know how to make money in dairying, and particularly in reducing the cost of production. We cannot affect the price of what we have to sell very much beyond the law of supply and demand, except by increasing its quality. But we can do something with the other end of the proposition—the cost of producing it. One great object of our dairy agitation is to teach the farmer how to produce his butter and cheese and milk at less cost to himself, and so increase his profit.

The transformation in the prosperity of individual farmers since 1870, as well as the decided increase of community wealth in Wisconsin, growing out of this growth of dairy knowledge, is the strongest proof to me of the soundness of the doctrine I preach to you.

I was among the first to commence the agitation of the dairy in the West, as far back as 1870. I did this because I saw the farmer and his farm yearly growing poorer under the impoverishment of wheat culture. I have been steadily identified with the dairy movement ever since. I have seen it transform a section of debt-burdened farmers into the wealthiest agricultural section in the United States.

SOME THINGS ESSENTIAL TO SUCCESSFUL DAIRYING.

BY GEO. T. POWELL, *Ghent, N. Y.*

I have been very much interested in the entire discussions which I have listened to today, and I believe that you must have discovered, by this time, that, in all things, there is some underlying principle, or law, which must be recognized, and which must be applied to achieve success. I think we must have discovered, by this time, in listening to Prof. Waters, in his talk on corn, that there is a law of principle

necessary to be applied, by which corn must be grown, and anyone who gets outside of that will fail, and that there is another law which controls the growing of wheat, oats and rye.

There is nothing more true than that in the dairy interests, about which I am to talk. We have, in the United States, over 16,000,000 of dairy cows. It is one of the largest and most important industries in this country. It stands in the most important relation to humanity, because of its furnishing necessary food to consumers. The dairy cow stands in another important relation to us as agriculturists, and that is, towards the fertility of the soil; and yet, while it is true that our dairy interests stand in this important relation, it is a fact that this great industry is seriously depressed, and there is discouragement all along the line. This is so in the New England states, as well as in my own state of New York, in which it is the leading interest, and also in your own State, because of the northwest, that new territory, coming into competition with us in the last quarter of a century, and for this reason, the industry is discouraged and depressed. One reason, also, for this depression, is the failure to apply the law which underlies the principle of successful dairying. Let me call your attention, rapidly and briefly, to a few points governing the principles which underlie successful dairying. In the first place, we have to bring all our operations of farming more in business methods. The day has gone by when we can take our farms and manage them, without adopting the best and most systematic methods, and come out with a good profit at the end of the year. That can't be done today, for the reason that you and I, in Pennsylvania and New York, are competitors with Wisconsin, Iowa, Illinois, and with the New England states, and when competition is very sharp, it is that the best business principles must be applied. It has been stated that the farmer is at a disadvantage over other business callings; that he is dependent, a great deal, on the elements for his success, and that he cannot calculate his business as well as other men. I do not believe that that is true, entirely; I believe that, today, we have it in our possession to so handle our business that we can start in with a dairy of cows and know where we are going to come out. We are carrying, on our farms, 10, 20 and 50 head of cows; and, as regards the individual capacity of these animals, but a few of us know what they are worth. It is said that, when a man takes a wife, he takes her "for better or worse;" and so with a cow, he takes her for better or worse; but, in the case of a wife, he finds out, soon after, whether for "better or worse." So, I say, that the best way is to go through your herds and note their capacity; and, if you discover your dairy animal is not giving you a profit, you will stop supporting her.

How are we to determine the individual capacity of the animals on our farms? For instance, in milk production or butter-making, this can very readily be done. Let me treat the butter-making side. There is today, in the possession of every farmer, a means by which to determine the value of every animal on his farm. Determine the amount of milk she gives, and, secondly, the value of the milk. At the New York farmers' institutes, in almost every institute, I have taken with me a little machine, known as the Babcock tester, and we have samples of milk brought in in order that we might ascertain the amount of fat in the milk; and I want to say that it is one of the most valuable things we give to the farmers. In the first place, it is

essential that each farmer takes a record of the quantity of milk each animal gives; secondly, that he may know the value of that milk to know whether the expenditure of labor and feed is profitable to him. In New York we have over one million, five hundred thousand of these sixteen million cows, and it has been ascertained that the average yield per head in New York state does not exceed 3,000 pounds of milk. Any dairyman can estimate that, upon that basis, there is no profit, but a loss, for the keeping of the animal is not paid for. The average yield of butter for the 1,500,000 cows in the state does not exceed 125 pounds. This is because we are carrying along such large numbers of animals which are unproductive. To overcome this, let every dairyman make a test of his animals, and those that are not paying him he can begin to discard and weed out, and keep those that run up into the six and seven thousand pounds of milk. In many herds where they have been sifted out, we find cows coming up to 10,000 pounds of milk each. We also find cows giving 325 pounds of butter. There is no discouragement with this class of dairymen, and they are entirely satisfied with their business. Let me give you the processes of testing this milk. Some of you may say you can't use the test, but you can depend on your experiment station; but your experiment station could not give the time to making milk analyses for the whole State. You may take the simple Babcock tester, which is a little centrifugal machine containing from four, six to ten bottles. Taking a certain quantity of milk from the cow, put about an ounce in a bottle, adding sulphuric acid, as directions will indicate; the bottles are placed in the machine and whirled for five minutes, when hot water is added, filling the graduated neck of the bottle, in which the butter fat rises, and the per cent. can be obtained. You have then a complete separation of the butter fat which is thrown out from your milk, and you can tell what the cow is worth. This is so simple and plain, and all that is required is accuracy in your measurement and handling. This brings to us the means of determining the value of our cows without trying to find it by experiment, and we need not keep them for five years, or a year, in order to determine whether they are of value to us. We have had some exceedingly interesting things occur in our institutes; it has been interesting to see farmers bringing samples of milk to us from what they supposed was their best cow, and the one they thought would be a surprise to their farmer friends; and, after they had been put through this machine (which under no circumstance will tell a lie) it has been interesting to see that that favorite cow would often prove the poorest representative of the whole herd. There was one instance where the samples of twelve cows were brought in to us, and the farmer said that when he married, his wife's father presented a valued cow to them, and they raised those twelve cows from the one, and brought the milk from them. When the test was made, it was the lowest test made at the institute, and they were raising that herd for years, supposing it was a valuable cow for the foundation—but, the truth is, they kept no figures and no accounts, and they knew not where they stood. This shows the importance of taking up our dairy interests upon a basis that, when we get through with our cow at the end of the year, we may think of our profit instead of our loss.

Here comes the importance of breeding—of selection. The whole success depends upon the foundation; hence, we have to study very

closely the different types of cattle. All over my own state, as well as your own, farmers are trying to make butter out of cows that have not the characteristics for butter. Ex-Governor Hoard has said that some inexperienced persons take a bull dog with them from the towns to hunt birds, which any country boy would laugh at; yet many farmers are just as foolish when they try to produce milk and butter from a cow that has descended from generations of beef producers. There is the law of type and temperament to be studied in cows. The dairy type is vastly different from the beef type. The temperament of the dairy type is quite different from that of the beef type. The cow that gives the greatest amount of milk is one that gives from food consumed, product, in that direction, from the law of her being. And this law is represented by what Ex-Governor Hoard, of Wisconsin, calls the nervous temperament, and the type or shape of this dairy cow is recognized by good dairymen.

The beef type is entirely different, and the form is such that the food consumed naturally goes to the production of flesh and fat. A man today will have to study the question of breeding in order to work in harmony with the right law. The dairy law that would give her the type and temperament by which she will give the best results is what he must seek for. I cannot present this question of breeding; I only throw out one or two points as to type and temperament in the dairy cow, and leave the rest for you to think about and study. Suppose we eliminate from these herds the poor producer and put in the 6,000 pounds of milk, and put in the 325 pounds of butter cow; then here comes the question, raised by some, with reference to over-production, and they want to know what we are going to do upon this question of dairy over-production; but there is no over-production of fine dairy products. We are, in our own country, today, the best consumers of dairy products; we consume 1,500,000,000 pounds of butter in our own country; and yet, as large as our production is, there is a demand for every pound of butter made in this country, and this demand can be increased to what it is in our power to meet.

The imitation butter, which I pronounce today, as I have done before in one of your State Board meetings, not only an imitation but a downright fraud, and that is oleomargarine. Take that one question out of our field today, and every single farmer in the State of Pennsylvania, and of every state in the Union, can stock his farm with 400 pound cows and he will not more than meet the demand, because the increase of population is so great that it will require all good cows to keep up the supply with the demand. So, no man need raise that question. We need not ask, "What shall we do with the product if we go breeding and selecting these large producing cows?" It will not come in our generation, or in many generations, that we shall have an over-production of good dairy products. Let me give you a few brief points: New York prominently stands to the front in dairy production, and for this reason we are effectually controlling this whole question of imitation of foods, and controlling it in dairy products, so that our reputation is now known in Europe, as no oleomargarine can be made or sold in New York state. Two years ago, the European buyers were here to purchase butter which piled up in the summer months. These agents were directed by English houses to purchase only in New York state, because it was known that upon the

statute books of New York state stood a law which made it impossible for an oleomargarine factory to exist on our soil, and that is the reason that the market is sought in our state, not only by adjoining states, but by England. We have, at the present time, a commissioner who is clothed with authority, and is furnished with \$85,000, annual appropriation, for the purpose of protecting the dairy and food interests from these invasions by imitations, and he has his inspectors in every city and town, watching the character of the milk, butter and cheese, that it shall not be mixed with impure products. Pennsylvania farmers have knocked at the doors of the Legislature for the same thing. New England is asking for it. When you put your shoulders and heads together and not only be satisfied with taking hold of the teats of the cows, but taking a strong hold upon the Legislature, then we will see prosperity come to us in dairy work, as well as in other lines. Go to work, so that your State Board may be authorized and be empowered to send this sort of production to the rear, and allow your dairy interests to occupy the position that they should in this great industry, and furnish the markets of Pennsylvania with pure butter. You are wise in circulating the petition asking that your State Board may be clothed with power and authority by which this important industry may be secure against frauds and imitations, as then will prosperity come to you dairymen farmers, as it has come to us in New York. I have been interested in every report that came from your meetings, in the fight that you have made in this State against the production of oleomargarine, and it seems to me that you individuals ought not to be compelled to put your hands in your pockets to bring about these prosecutions in order to blot out this fraud and deception. The consumer is just as much interested in this question—the man who lives in the city, in the village, the man who works down in the mines, is just as much interested as the producer on the farm himself, on the score of health alone.

Let me touch upon another question, and that is the importance of maintaining the dairies on your farms in order to keep up the fertility of the farm. We are living in an age in which it is necessary for us to meet the rapid strides which the development of our country is making. Hence, we have to meet these questions of close competition in the settlement of new countries and new territories; we can't stop the building of railroads; we can't stop the immense production that is going on; but it is necessary for us to study these conditions that confront us; and, in the New England and eastern states, we should not attempt to grow extensively grains that compete with the west, for, under the present condition of things, it is impossible for us to do so with profit; but we should learn to change our conditions, and give attention to dairy interests, as well as other higher priced products, such as of horticulture, fruit culture and vegetable culture, and drop the competitive grain and beef products. We can put these farms in good condition and keep them in good condition by the cow, and, at the same time, use her as the factor to use up the coarse productions of the farm, which we will not denote here, and thus we will return to the soil what we have taken from it. It is very true, when you sell corn, wheat, oats, or timothy hay, you are taking something from the soil which it has given up. We can return to the soil that which has been taken from it better through this dairy line than any other, for the reason that, in selling butter, we are selling that which

carries off the least fertility, because in 2,000 pounds of wheat we remove from the soil something like eight dollars' worth of these elements of plant food; in every ton of timothy, \$5.00; in every ton of clover, \$9.00; in every ton of potatoes, \$1.77; in every ton of corn, \$6.00; in every ton of oats, \$7.61. You may take from this same farm, 2,000 pounds of butter, and you remove only 66 cents' worth of these elements of plant food. However, this statement needs some qualification, and one thing I might mention is that nothing should go into the butter which belongs to the cow stable, there being so much dependent in the methods of handling milk and butter.

I can give you a scale of dairy prices existing in our state. I can name you some who are getting 75 cents a pound; others who are getting 80 cents a pound for every pound of butter made, and I can pick out many getting 16 cents a pound. Some say that the one that gets 80 cents a pound is some wealthy farmer who is running a big farm with capital, but such is not the fact. Near me is the Vice President of the United States, who has a large dairy, and he is receiving 60 cents for his butter. The clubs and people who are taking his butter would not take it were it not for its good quality. It represents skill that is put into it—its price is measured by the skill that is put in it, and not by the individual who produces it, because the people who are buying this would not take this butter were it not fine butter. The essentials for making this fine butter are many; and yet they ought to be understood by every dairymen, so that he may be able to reach highest success in his business. Let me touch upon one point, which, I think, is the solution of this business, and that is, we should adopt more fully the system of co-operation, for the reason that upon hundreds of farms there are not the proper facilities for making the best butter. The farmer, or his wife, may be skillful in making it, but is not surrounded with the proper facilities. Here let me suggest the value of co-operation; if we could learn the value of that principle as men in other lines of business have learned it, and could combine our labor, it would be the means of bringing about much more satisfactory results. Farmers should study the value of using their best efforts on a co-operative plan, and establish creameries with the necessary capital. Put in your machinery; put in your most skillful butter-maker, and take this whole question right off of the farm, and instead of every farmer buying his fixtures for an individual creamery, put that much less in a co-operative plan, and instead of each farmer sending his few pounds, he will send thousands of pounds, and in this way will bring the whole product within the range where it brings a good price.

The value of labor has risen, and here we are confronted with competition and are compelled to meet competition with the cheap lands and cheap labor of the west, made so by machinery, and that means a question which we are not yet able to solve on the same line of production.

After having listened to what has been said here today, I believe there never was a better time for dairying than the present. I believe in the weeding out of unprofitable animals, selecting wisely of the best, and building up our herds. I believe there is no one line of business or calling which promises so much for the farmer as this question of intelligent dairying. I can give you this one fact, that in going through towns in my state, and taking the actual facts and figures,

in a dairy census, I discovered valuable information, and it illustrates what can be done. It was a case in Delaware county, where two young men started in 12 years ago with a herd of cows, and they started in largely in debt, and, in a period of 12 years, have paid every dollar of indebtedness and have built new houses and barns, and today have the whole thing paid for. What were the conditions? They were men who understood their business. Their cows averaged 347 pounds of butter per year, and they got an average price of 25 and 30 cents for their product. There is money in this business. These young men studied their business, and made use of all the means they had at their command in order to produce the best results. They knew what each cow was doing, and got the herd up to 30 cows. This can be multiplied over and over, and I am sure if you take this method and adopt it, you will be blessed with abundant prosperity.

MR. KISTLER. Will you tell us what breed of cows you use?

MR. POWELL. I can't select any one special breed, but where you come to the special dairy type, it is represented in the Jersey, or the Guernsey, or in the Holstein, or Ayrshire—you will find there the dairy cow, and you can't mistake the type. I don't mean to say that you should invest a large amount of money for high blooded stock. I believe in pedigree, but pedigree to be accompanied with production. Some of the highest tests made by the Babcock machine were invariably found among the natives. There are native cows having good blood in their veins, which will make the best foundation to begin with, and it is not necessary to pay for a long pedigree, outside of a pure-blooded bull, for among our native cows is some of the best foundation to build upon.

SECRETARY EDGE. Do you think it is a fact that if the farmers would spend the money they have for other cattle, in establishing their own cattle, they would be better off?

MR. POWELL. There is no doubt about that. I believe that by selection we could have distinctive American breeds of cattle, quite as valuable as any of our foreign importations. We have so improved upon the cattle that have been imported, that we are now exporters of the same breeds.

NOTES ON NITROGEN.

COMPILED AND ARRANGED BY THE SECRETARY.

NITROGEN FROM THE SOIL.

Prof. Thaer has recently estimated, from the results of many trials, that of each 100 pounds of nitrogen carried off the land in crops, 55 pounds are derived from the soil nitrogen, and 45 pounds from the manure. In special trials, made to determine how much assimilable nitrogen could safely be applied as manure, it appeared that, during the 11 years of experiment, 52 pounds of nitrogen were harvested on the average, per year and per acre, while only 24 pounds of nitrogen per year were applied to the land in the manure. More than

this amount of nitrogen could not be applied commonly, except at a disadvantage. Rye, indeed, bore 35 to 38 pounds of nitrogen to the acre, and oats and potatoes 43 to 52 pounds, though the largest amount named did not increase the yield of potatoes. Thaer concludes that in general, and for ordinary conditions and circumstances, about half as much nitrogen may be applied in the fertilizers as would be expected to be contained in the crop.

Mr. Lawes has frequently insisted that the farmer must not expect to obtain in the increase of the crop, an amount of nitrogen equal to that supplied in the nitrogenous fertilizers put upon the land. He has dwelt at some length on the fact that, in the experiments of Dr. Gilbert and himself, where sulphate of ammonia and nitrate of soda were applied to grass, wheat, oats and barley, not much more than half the nitrogen applied to the land was recovered in the first crops taken after the manuring, regard being had, of course, to the increase of the crops over and above what was obtained when fertilizers were used that contained no nitrogen, but only ash ingredients.

He remarks, incidentally, that it is by no means certain whether as much nitrogen is not recovered in crops grown with nitrate of soda as in those grown with other nitrogenous fertilizers, even those as slow in action as rape-cake and barnyard manure. This point is difficult to determine, since dung decomposes very slowly and its influence is felt for many years. Thus, in the year 1875, Lawes and Gilbert could still perceive some slight effect, due to dressings of dung, which had been applied to pasture grass in 1863; that is to say, it had been applied to the pasture for the last time in 1863.

They found that root crops—thanks, apparently, to their long term of growth, and to the fact that they grow during the latter part of summer, when nitrification is active and leaching rains infrequent—returned to them a larger proportion of nitrogen applied in the fertilizers than cereal crops did. In one set of experiments, for example, they grew sugar beets five years in succession, and manured one parcel of them during the first three years heavily with nitrate of soda, in addition to other things; and, on calculating the amount of nitrogen taken up by these five crops of beets grown with nitrate of soda, first deducting the produce grown on contiguous plots manured with ash ingredients alone, it appeared that the quantity of nitrogen obtained was very nearly equal to the amounts that had been applied in the form of nitrate of soda.—*Storer's Agriculture*, Vol. 1, page 408.

EXPERIMENTS WITH NITROGEN.

The forms of nitrogen selected were nitrate of soda, azotine or dried blood, and sulphate of ammonia. The main object was a comparison of the nitrate of soda with the dried blood, and sulphate of ammonia was introduced into the series for comparative purposes. The forms of nitrogen used in nearly all commercial fertilizers are dried blood, and the nitrogen of organic compounds, like bone meal or cottonseed meal.

It is well ascertained that nitrate of soda is superior to sulphate of ammonia for wheat, but comparatively little seems to be known of the relative merits of nitrate of soda and organic oxygen. The present

price of ammonium salts is such that they are not generally used in compounding fertilizers, and it so happens that the nitrogen of organic compounds is used in the so-called "ammoniated fertilizers." Nitrate of soda furnishes more nitrogen for the same money, but it is very difficult to keep a mixture of super-phosphate and nitrate of soda.

It will be noticed (from the report of the experiment), that the nitrate of soda gave by far the best results, the gain being nearly double that of the organic nitrogen, and about one-half more than that for the ammonia compounds. There appears, on the whole, no advantage from the use of fractional applications, while in the case of ammonia compounds, there was a decided loss in fractional applications.

Here (in another table) the nitrate of soda seems to be the controlling factor, and, so far as the appearance of the plants indicated, there was no advantage from the change of form. All the plants in this series, to which nitrogen was applied, looked practically alike from the beginning to the end of the experiment. No appreciable difference could be seen in the fall, or at the opening of spring, up to April 10 to 15, between the plats to which nitrogen had been applied and those which had received no nitrogen. On April 20, the plats to which nitrogen had been applied showed a darker color, and the plants were larger and with broader leaves. From this time on the nitrate of soda plats seemed to lead the others. On May 18 the ground was too dry for the wheat to make much growth, but the rain of May 20-21 was very seasonable, and the nitrogen applied May 18 was washed into the ground. At this time the nitrate plats seemed better than those having sulphate of ammonia, and both nitrate and ammonia plats were heavier and of a much darker color than those receiving azotine. The plants on the plats that had received nitrogen were about six inches taller than those receiving no nitrogen, and this continued until the grain was ripe.—*Prof. H. A. Huston, Purdue University Experiment Station.*

NITRATE OF SODA.

Nitrogen is the most expensive, important and effective element of plant food, and, at the same time, is one that is generally deficient in the soil.

There are many sources of nitrogen, such as sulphate of ammonia, which is obtained during the process of making gas, dry ground fish, cottonseed meal, dried blood, leather scraps, etc. But none of these furnish nitrogen in the form in which it is taken up by plants, namely, nitric acid. This can only be furnished to plants in the form of nitrates. Nitrogen, applied in any other form, has to be converted into nitrate before it can be taken up by plants.

A nitrate is the result of a union between nitric acid and an element called a "base." Nitric acid contains the nitrogen that is necessary for the growth of plants. It unites with many different elements, and forms a number of salts that are useful for many purposes. For instance, when united with potash, it forms nitrate of potash, or what is commonly called "nitre" or "saltpetre;" when united with soda, it forms nitrate of soda, which is the best form in which to furnish nitro-

gen to plants. When we say the best form, we mean the best practical form. Nitrate of potash (saltpetre) would be just as good, but is much too expensive. Nitrate of soda not only furnishes nitrogen in its most available form, but it furnishes it at a lower price than almost any other source. The exceptions are a few organic substances in which nitrogen exists in an insoluble form.

English and European farmers, instead of buying their nitrogen in complete fertilizers and paying over 20 cents per pound for it, used, during the year 1890, over 800,000 tons of nitrate of soda as a fertilizer, while not 10,000 tons were used as a fertilizer in America. The demand for nitrate of soda in Europe has steadily increased, as is shown by the following table.

Exports of nitrate of soda from Chili during the six years ending December 31, 1890:

1885,	425,000 tons.
1886,	440,000 tons.
1887,	700,000 tons.
1888,	750,000 tons.
1889,	930,000 tons.
1890,	1,050,000 tons.

American farmers, gardeners and fruit growers are supposed to be ready to "catch on" to a good thing. And, as soon as our agricultural journals let them know the facts in regard to the great value of nitrate of soda as a fertilizer, our farmers will not be slow to use it. The reason why so little is said about nitrate of soda is simply owing to the fact that there is "no money in the trade." It is an article that everybody can sell and consequently no one can afford to advertise it. The manufacturers of "complete fertilizers" pay the agricultural papers large sums of money every year for advertising, and, consequently, the editors do not like to publish anything that might injure this trade. The real friends of agriculture, however, will be well pleased to know that there was a decided increase in the demand for nitrate of soda in this country the past spring.—*Jos. Harris, M. S.*

ACTION OF NITROGEN.

The influence of nitrogen in its various forms upon the plant growth, is shown by at least three striking effects.

First. The growth of stems and leaves is greatly promoted, while that of buds and flowers is retarded. Ordinarily, most plants, at certain periods of growth, cease to produce new branches and foliage, or to increase those already formed, and commence to produce flowers and fruits, whereby the species may be perpetuated. If a plant is provided with as much available nitrogen as it can use just at the time it begins to flower, the formation of flowers may be checked while the activity of growth is transferred to and renewed in the stems and leaves, which take on a new vigor and multiply with remarkable luxuriance. Should flowers be produced under these circumstances, they are sterile and produce no seed.

The second effect of nitrogen upon plants is to increase, in a very marked degree, the relative proportion of nitrogen in the plant.

Since ammonia compounds and nitrates dissolve easily in water, is there not danger of their being carried away in drainage water from the upper soil, out of the reach of the plants?

Experiments have been made to settle the question, and results indicate that ammonia compounds are largely retained in the soil. Nitrates are apt to be washed out and lost in the case of bare fallows; but, when the soil is covered with vegetation, there is little or no loss, for the reason that the roots of growing plants absorb nitrogen very readily. Some nitrogen is also lost by organic matter in the process of decay, escaping into the air as free oxygen.

These losses of nitrogen are, to some extent, replaced naturally by means of the nitric acid and ammonia dissolved in rain and dew, also by organic matter decaying at the surface of the soil, and also by conversion of the free nitrogen of the air into some form in which plants can take it up and use it. These natural additions of nitrogen do not usually make good, on the farm, the losses, and in time the nitrogen becomes insufficient to produce paying crops without the addition of nitrogenous manures.—*Dr. P. Collier, Geneva Experiment Station, New York.*

NITROGENOUS MANURES.

In the next place, as regards nitrogenous manures, the four fully-manured plots—13, 14, 15 and 16—show that the plots which were formerly manured with the soluble salts, nitrate of soda and sulphate of ammonia, and produced the largest crops, are now in a more exhausted condition than those to which horn dust and dried blood were applied. The nitrate of soda plot maintains its superiority over the sulphate of ammonia one; and, as we may be justified in assuming that all the nitrogen conveyed to the land in these two forms has long ago been utilized by the crops grown, or lost through drainage, we may fairly ascribe the greater fertility of the nitrate plot to the better condition of the soil, due to the larger amount of organic residues derived from the heavier crops produced upon it. In the case of the two other plots, manured with more slowly decomposing substances, horn dust and dried blood, it is evident that there still remained in the soil some available organic residue, derived from these substances, six years after their application ceased; but it is also evident, from the results of last year's crops, that one of these, (*viz*, dried blood), has been exhausted, while the horn dust still continues in the seventh year to slowly yield up some residue of its nitrogen.—*Report of Highland Agricultural Society of Scotland, 1893.*

USE OF NITROGEN.

In reviewing the work of one of the German experiment stations, Dr. J. B. Lindsay, of Amherst, Massachusetts, draws the following conclusions:

That all leguminous plants, and only leguminous plants have the power to take their nitrogen from the air.

The legumens will utilize the soil nitrogen in preference to the air nitrogen, providing they have the opportunity.

Generally speaking, it is not advisable to apply any nitrogen to aid

in the growth of leguminous crops. There are, however, exceptions; for example, on sandy soils, very poor in nitrogen. In such cases the crop, at a very early stage in its growth, begins to manifest its hunger for nitrogen. If, at that period, 30 to 40 pounds of soda nitrate are applied per acre, this nitrogen hunger will be relieved, and the plant becomes stronger and better able to exist till the bacteria co-operate with it in supplying the nitrogen needed.

The grains in the following order, viz: barley, wheat, rye and oats, have the greatest need of soluble nitrogen, such as nitrate of soda and sulphate of ammonia, because of their short growing period; while roots, late potatoes, and grasses, having a longer period of growth, can use the slower, lasting forms of nitrogen, such as stable manure, tankage, bone, nitrogen, etc., to better advantage.

In order that the plant use costly nitrogen to advantage, it should be well supplied with potash and phosphoric acid.

Chili saltpetre yielded an increase of ten per cent. over ammonium sulphate applied to barley and wheat.

The cause of this superiority of the Chili saltpetre lies in the fact that, during the nitrifying process of the sulphate of ammonium, ten per cent. of its nitrogen escapes. Whether this nitrogen escapes into the air, or whether it is consumed by the nitrifying organism, as Frank believes, is unknown.

Warm, porous soils, rich in lime, favor the most rapid nitrification of ammonia compounds. When the soil is lacking in lime, sulphate of ammonia works poorly as a soil fertilizer. Its action can be greatly improved by liming the soil. The lime neutralizes the sulphuric acid, set free in the process of nitrification, and thus prevents an acid soil. It is well known that bacteria, as a rule, will not work when free acid is present.

Soda, as it is found, for example, in nitrate of soda, or in common salt, contrary to previous teaching, can, in certain plants, take the place of potash to a considerable extent, and exerts a correspondingly beneficial influence. This has been proved in the case of barley and poppies.

Wagner's experiments show that nitrogen in different manures has the following relative value:

Nitrogen in Chili saltpetre,	100
Nitrogen in sulphate of ammonia,	90
Nitrate in blood and green plants as manure,	70
Nitrate in fine bone, ground fish and tankage,	60
Nitrate in stable manure,	45
Nitrate in fine, ground wool,	30
Nitrate in fine, ground leather,	20

FISH SCRAP.

In accordance with these different modes of treatment, the amount of water contained in the products (fish scrap), varies widely. Sometimes there is no more than 8 to 9 or 10 to 12 per cent. of water, while some samples of the scrap contain from 18 to 22 per cent. Occasionally, 30 to 40, or even 50 per cent. of water, is met with in fish scrap.

These materials have hitherto been used, for the most part, by man-

ufacturers of fertilizers, for mixing super-phosphates, and the value of scrap is commonly estimated according to the amount of nitrogen contained in it, which usually ranges from six to eight per cent. But the percentage of phosphoric acid is nearly as high, viz, six to seven per cent.

An analysis by Arendt, of Norwegian fish scrap, gave of

Moisture,	17 per cent.
Nitrogen,	10½ per cent.
Phosphoric acid,	4 per cent.
Organic matter,	72 per cent.
Ashes,	11 per cent.

Other samples have shown more phosphoric acid (13 to 17 per cent.), and less nitrogen, (8½ to 9 per cent.). Some of them were of scrap that had been steamed to remove the oil.

American scrap, such as that above described, is an extremely cheap manure. It can usually be bought at wholesale for \$12.00 to \$15.00 the ton, and seldom or never costs more than \$18.00. At these rates, its fertilizing constituents come at very low prices, the nitrogen, in particular, costing less per pound than so good an article can usually be bought for in its other forms. The reason why this is so, appears to depend on the rather unpleasant odor of the fish scrap, which creates a prejudice against it in the minds of common carriers, and so hinders the transportation of small parcels of the material. In case the scrap costs \$15.00 the ton, and that a ton contains 120 pounds of phosphoric acid, the value of this constituent will be \$6.00, if we allow five cents for each pound of it; so that, even if there be no more than 120 pounds of nitrogen in the ton, this constituent will be worth \$15.00 less \$6.00, or \$9.00. That is to say, the pound of nitrogen will come at 13 cents. It would probably be fairer, however, to call each pound of phosphoric acid worth six cents, and to argue that the material contained seven per cent. of nitrogen, instead of six per cent., as in the foregoing calculation.

There can be no question that farmers should buy this cheap material direct from the fishermen, and use it as such, under its own name, instead of paying a comparatively high price for it, as is now often the case after it has been admixed with super-phosphates. I have, myself, found fish scrap to serve extremely well as a substitute for barnyard manure, when used in conjunction with wood ashes or other potassic fertilizers.—*Storer's Agriculture, Vol 1, page 374.*

NITRATE OF SODA.

In northern Chili, formerly southern Peru, in the province of Tarapaca, there is a vast arid region, a table land, three thousand feet above sea level, stretching north and south for 80 miles. The trades blow all the year from the Andes, so that the climate is absolutely dry. There is no wood, no water, no vegetation there. Drinking water has to be brought 45 miles. The only living things to be met with are the mules which carry the freight to the port of Iquique, and the vultures, who are prompt to call on a mule in distress. Lot's wife, in her present state, would find the climate by no means unfavorable, and would

shine in Tarapaca society. On this plain occur vast deposits of nitrate of soda. It lies in strata 500 yards wide and 7 to 8 feet in thickness in places, interrupted by deposits of common salt. It also occurs in hollows, which look like dried up lakes, coating their sides and covering the bottom with a layer of salt. This crude nitrate of soda is purified at the coast by solution, separation from sand, and crystalization, and is then shipped to Europe and the United States.

With regard to the origin of these deposits, we know little. It is conjectured that the nitrogen came, in the first case, from guano deposits on the shores on an inland salt lake or sea, that through atmospheric agency it was oxidized, and, on evaporation, was left in its present shape.

In 1820, the first cargo was sent to England, but was thrown overboard in the harbor because the duty was so high that it would not pay to pass it through the custom house. In 1830, a cargo came to the United States, but there was no sale. In that year, 18,700 tons were exported from Iquique; in 1840, 227,300 tons; in 1850, 511,800 tons; in 1860, 1,370,000 tons; in 1870, 2,743,400 tons. In 1872, the amount had risen to 4,000,000 tons, and, in the following year, the Peruvian government took the matter into its own hands, and decided to export only 4,500,000 tons annually, and so keep the price constant.—*Dr. Jenkins in Connecticut Agricultural Report.*

BONE-MEAL.

According to Heintz, the dry leg bones of oxen and sheep contain 6 to 7 per cent. of carbonate of lime, 58 to 63 per cent. of phosphate of lime, 1 to 2 per cent. of phosphate of magnesia, about 2 per cent. of fluoride of calcium, and 25 to 30 per cent. of organic matter.

Payen and Boussingault found $6\frac{1}{2}$ per cent. of nitrogen and 8 per cent. of water in raw bones, and $5\frac{1}{2}$ per cent. of nitrogen and 30 of water in steamed bones as they came from the rendering vats. When dry, the steamed bones contained 7 per cent. of nitrogen and $7\frac{1}{2}$ per cent. of water.

Heintz's figures afford little evidence as to the composition of bone meal as it occurs in commerce, for the quality of different samples varies widely. Even bones themselves vary in composition, according to the kind and age of the animal from which they come; and those obtained in commerce are sometimes contaminated with as much as 10 to 12 per cent. of sand and 8 per cent. of water. Hence, the amount of phosphates in them may range from 44 to 60 per cent., and the nitrogen may vary very considerable as to its value.

According to S. W. Johnson, the nitrogen in hard, raw bone is considerably more soluble and decomposable than that in the mixture of soft bones, cartilage, tissue and grease, which makes up "kitchen bone," so called; and, as a rule, the hard, firm bones contain more nitrogen and phosphoric acid than the softer kinds, which are wet and greasy. Such damp, soft bones are often discarded by manufacturers of bone black, as unsuitable for their purposes, and subsequently converted into bone meal, admixed with plaster of Paris or salt cake, or some such material, which has been used either as a dryer or preservative, or for both of these purposes. "Kitchen bones," moreover, and all bones that have been gathered by bone-pickers, are apt to have

sand and loam adhering to them, or lodged in their cavities; and, at the mill itself, it is customary, occasionally, to throw in inert matters of one kind or another to clear the grinding surfaces.

Beside the dryers and preservatives already mentioned, bone meal often contains small quantities of ground oyster shells, coal ashes, waste lime, plaster of Paris, coal or loam. From all of which it appears that the terms "ground bone" and "bone meal" are applied properly enough to products which may vary in no inconsiderable extent, both as to their composition and their value. There is a limit of tolerance, however, as regards these extraneous matters, and Prof. Johnson has urged that bone meal which contains less than 19 per cent. of phosphoric acid, or more than 5 per cent. of matters insoluble in strong acids, should be regarded as an adulterated article.—*Storer's Agriculture, Vol. 1, page 226.*

NITROGEN.

Our present knowledge of nitrogen may be expressed in the following propositions:

I. Almost all, if not all, the nitrogenous contents of all vegetation, is derived by the plant from or through the soil. It has been maintained by some, that certain orders of plants, particularly from among agricultural vegetables, the broad-leaved root crops, derive at least a small portion of their nitrogen through their leaves, from the atmospheric nitrogen or nitrogenous compounds. This, to say the least, is extremely doubtful.

II. Nitrogen exists in the soil in three classes of conditions:

(a). Those compounds which are insoluble and are intermediate products of vegetable decay, classed as nitrogenous organic bodies, etc.

(b). The soluble compounds of nitrogen, including ammoniacal and nitrate salts.

(c). Free nitrogen, held in solution in soil, water or in the air, held in the pores or condensed in the surfaces of the pores of the soil.

III. The nitrogen of the soil is derived from three sources:

(a). From the decay of former vegetation stored in the soil.

(b). From the air, carried down as ammonia, nitrates and organic dust in solution or suspension in falling rain, snow or dew.

(c). From the circulation of the air through the pores of the soil.

(d). From additions in the form of barnyard manures or chemical artificial fertilizers.

IV. Nitrogen, in the insoluble form, and as free nitrogen, cannot be assimilated by the plant. Hence, the two food forms of nitrogen are ammoniacal and nitrate salts; and, in the light of our information on the subject, it seems probable that it is in the latter form, or as nitrates, that the plant finds the conditions in which it is best able to avail itself of nitrogenous food offered to it.

Here, as in many other cases where we attempt to question the processes of nature, we find ourselves unable to obtain a definite answer to our query. In this instance there are on record certain admirable experiments, some quite recent, which seem to indicate that in some cases, with certain plants, under certain conditions of age and treatment, the plant is best able to avail itself of the nitrogen

offered in the form of ammonia. But the general statement given above is expressive of the most successful practice and experiment.

V. The soil has, to a certain extent, the power of retaining within itself the soluble nitrogen compounds (ammonia and nitrates), by partially physical, but more by chemical absorption.

VI. But, in consequence of their insolubility, these same assimilable forms of nitrogen are also likely to be lost by the action of the percolating waters.—*Prof. E. S. Breidenbaugh, Gettysburg, Pa.*

NITRIFICATION.

Recent investigations have shown very clearly that the change of ammonia or of organic nitrogen compounds into nitrates in the earth, is not a process of chemical oxidation, pure and simple, such as might occur if the nitrogen compounds were treated in the laboratory with powerful oxidizing agents. It is not a plain chemical action, such as is obtained when caustic ammonia is boiled with potassium permanganate, or subjected to the action of peroxide of hydrogen. It appears, on the contrary, that the intervention of a microscopic organized "ferment" is necessary in order that the nitrates may be formed in the earth. Precisely how this ferment works, is not yet known. All that is known is that it is a minute microscopic plant, an organized ferment, like yeast, which, under favorable conditions of warmth, moisture and darkness, lives upon the nitrogenized organic matters, and upon ammonia compounds, as well as upon things which it finds in the earth; and one result of its life is the formation of nitrites and nitrates. Not to force the analogy, it might be said that this production of nitrates, by the agency of living things, is somewhat akin to the production of carbonic acid by men and animals; for animals always live in localities that supply carbonaceous food and air, and it was noticed very early that carbon is in some way oxidized to carbonic acid in places which animals frequent.

Tolerably high temperatures favor nitrification. Careful experiments have shown that nitrification is extremely feeble below 40 degrees F., even if it does not wholly cease. The formation of nitrates is clearly appreciable, however, at temperatures of about 53 degrees, and it increases rapidly as the temperature rises above that point. Just below 100 degrees nitrification is at its maximum. Experiments obtained results, in the course of a few days, when operating at 98 degrees, that would, in our climate, have required months or years, in ordinary outdoor experience. Above 100 degrees, the formation of nitrates decreases rapidly as the temperature rises. At 113 degrees, they form less rapidly than at 59; at 122 degrees, only very small quantities are formed, and above 131 degrees, no trace of the formation of nitrates could be detected. Under favorable conditions, other things being equal, ten times as much saltpetre can be obtained at 99 degrees as at 57. As has been said, a proper proportion of moisture promotes nitrification; but drought is well-nigh fatal to the process. Indeed, in absolutely dry air, the ferment perishes, and mere dryness, as ordinarily understood, stops the action of the ferment as long as the condition of dryness exists.

Warrington, on searching for the nitric ferment in loam at various depths, was no longer able to detect it with constancy and certainty

at depths greater than 18 inches. Specimens of soil taken from depths less than nine inches, always caused nitrification in diluted sterilized urine, i.e., urine prepared for the experiment by destroying all living things which may have been contained in it. But soil taken from a greater depth than nine inches often failed to excite the nitrification in the urine, and those from 18 inches seldom excited it. Only on one occasion in his experiments was nitrification excited by soil taken from a depth of three feet.

It has been noticed that the nitric ferment does not prosper very well in strong light. It appears to need darkness in order that it shall thrive. Hence, perhaps, one advantage in keeping manure in cellars and sheds. Probably it will be better to establish compost heaps under cover, or in the shade of trees, even, than in the open air.—*Storer's Agriculture, Vol. 1, page 298.*

NITROGEN AND SHADE.

Already, the ferment theory of nitrification may be used to explain, in a wholly unexpected way, a very important tenet of modern agriculture. It has been observed, namely, as the result of wide experience, that, while grains and the grasses are especially benefited by nitrogenous manures, such as ammonium salts, nitrate of soda, and Peruvian guano, there are other crops, such as clover, turnips and other roots, Indian corn, even, that succeed best when treated with super-phosphate of lime, or bone meal, or wood ashes. It is, consequently, held as a general rule that in systems of rotation the nitrogenous manures had better not be applied to the root or clover crops. And this, in spite of the fact that a crop of clover, taken from a field which has received no nitrogenized manure, may contain two or three times as much nitrogen as a wheat crop taken from the same kind of land after the addition of guano or nitrate of soda. It appears, in fact, that clover, far more than wheat, has the power to provide itself with nitrogen. Indeed, so much nitrogen is accumulated by the clover plant, that the mere roots and stubble of clover are esteemed a valuable manure for the wheat which follows clover in many courses of rotation.

In explanation of these peculiarities, the idea suggests itself that the ground, shaded by the leafy crops, such as clover and turnips, may, perhaps, be a peculiarly fit and favorable nesting place, either for the microdemes which cause nitrification, or for those which generate ammonia, and that by their means the inert nitrogen of the soil is rapidly changed to nitrates, (or in some cases to ammonia). The grain crops, on the contrary, having no such power to foster the ferment microdemes, have to be supplied artificially with some kind of nitrogenous food.

There is, moreover, another way of looking at the matter, for it is a fact that the grain crops and clover grow at different times and seasons. The really vigorous growth of the cereal grains occurs in spring and early summer; that is to say, at a time when the store of nitrates in the soil has been reduced to its lowest terms by the rains of autumn, winter and early spring, and when only comparatively small quantities of nitrates are in process of formation because of the coolness of the soil. But a crop of clover, of roots, or of Indian corn,

grows most freely in mid-summer. Such a crop not only finds as large an amount of nitrates in the soil to begin with, as the cereals found, but it has continued access to the nitrates that are formed in the soil during the hot summer months. It is on this account, doubtless, that Indian corn has been found to differ so much from the other grains in respect to the kinds of fertilizers it requires. American farmers have, as a rule, found no special advantage in giving their corn crops nitrates or ammonium salts, although these fertilizers are regarded almost as specifics for wheat and barley in countries where agriculture is somewhat advanced.

NITROGEN AND AMMONIA.

Nitrogen is a gas, and in that form cannot be used in fertilizers. Therefore, whenever we speak of nitrogen in fertilizers, we do not mean that nitrogen exists in them as a simple nitrogen. As previously stated, the nitrogen in fertilizers is always combined with other elements, and may be present in one or more different forms. First, in the form of nitrates, as in nitrate of soda. Second, in the form of ammonia compounds, such as sulphate of ammonia; and third, in the form of organic matter, as animal or vegetable, as dried blood, meat, tobacco stems, etc. Chemical analyses, according to official methods, do not attempt to ascertain and state in which form or forms the nitrogen exists in a fertilizer. Therefore, the numbers in the columns under "determined as nitrogen," are intended to state simply the amount of nitrogen present, without regard to the form in which it is present, or, expressed in another way, how much nitrogen there would be if it were present in the form of pure nitrogen or nitrogen gas.

Ammonia consists of nitrogen combined with hydrogen. A pound of nitrogen will form more than a pound of ammonia, because the ammonia formed from a pound of nitrogen will contain that pound of nitrogen, plus the necessary amount of hydrogen added to form ammonia. The chemical relations of nitrogen and ammonia are such that 14 pounds of nitrogen will unite with exactly 3 pounds of hydrogen, and will, therefore, produce just 17 pounds of ammonia; or, one pound of nitrogen will make 1.214 pounds of ammonia. The figures contained in the column "equivalent to ammonia" are, therefore, obtained by multiplying the figures in the column under "determined as nitrogen," by 1.214. The figures in the "equivalent to ammonia" column do not indicate that the fertilizers actually contain these amounts of ammonia, for they may contain no ammonia compounds at all, but it is intended to state under "equivalent to ammonia," simply how much ammonia there would be if the nitrogen were all in the form of ammonia.

If, as is the usual practice, the manufacturers' guaranteed analysis states the amount of nitrogen only in the form of ammonia, and it is desired to know how much nitrogen the ammonia contains, simply multiply the number representing the amount of ammonia by .8235, since one pound of ammonia contains .8235 pounds of nitrogen.

Manufacturers very commonly express the amount of nitrogen in the equivalent of ammonia, probably for the reason that, expressed as ammonia, larger figures are obtained than would be if expressed as

nitrogen; and the fertilizers appear to farmers to contain more nitrogen. While this method is in accordance with legal requirements, and is entirely fair on the part of the manufacturers, farmers should know that "nitrogen" and "ammonia" are not the same thing, since one pound of ammonia contains only about seven-eighths of a pound of nitrogen.—*Dr. P. Collier, Geneva Experiment Station, New York.*

EXTRACTS FROM INSTITUTE ESSAYS.

The space at the command of the Board precludes the publication of institute essays entire; the Secretary has, therefore, taken this plan of securing recognition for the greatest possible number of those who have kindly assisted at institutes with essays. The extracts have been made as extensive as possible under the circumstances, and it is to be regretted that much valuable matter now on hand cannot be used.—*Secretary.*

TEACH AGRICULTURAL CHEMISTRY.

If we want agriculture to prosper, to keep pace with other callings and professions, and keep pace with the great procession in the advancement and elevation of our calling, we must educate and fit the boys for the life on the farm. Sometime ago, at a teachers' institute, during the discussion of the question of free text books, I made the venture to suggest an additional text-book, that of agricultural chemistry, to be taught in our public schools, at least to farmers' sons and daughters. And, to my surprise, I found I could not have struck a more unpopular chord among the school teachers than that of agriculture in our schools. Now, all of these teachers were raised on the farm, and some were tillers of the soil during the summer. They knew that they must be qualified to teach, or at least to obtain a certificate. But the idea that no qualifications were needed for agriculture seemed startling and absurd. Do not understand me that I undervalue the knowledge of the different branches taught; this is necessary to survey the area, and delve down deep into the recesses in which agricultural chemistry will lead you. A young man may possess a fair education under the facilities afforded in our common schools, but how much of it lies unused when he draws the furrows and sows the seed? I am making this plea for the rural districts. What property furnishes the largest share of taxes to run the schools in the rural sections, but the farm? If the farm furnishes the revenue, should it not, in return, demand that their sons shall have some benefit from it to enable them to run the farm better—make it more pleasant and remunerative? Then the farmer needs an education along the whole line of a farmer's life. Some of it can only come by experiments. An education will help you to make these experiments and

solve many difficult problems. True and false economy must be studied and considered. How to meet competition, how to grow, market and sell. To take care of and mind his own business, to know when he is carrying unjust and unequal burdens, and how to apply the remedy. A good agricultural journal is an indispensable companion for the farmer. Not only get it, but read it and practice as far as applicable to your conditions. Thus an education will not only develop the faculties, give breadth and depth to the ideas, make success more sure and easy, but enable you to admire and drink deeper of nature, and a higher conception of Him who created all things and pronounced them very good.—*D. B. McWilliams, Walnut, Pa.*

WHY AM I A GRANGER?

A privilege or courtesy, call it what you will, is granted in the Grange to women, which is accorded to them in no other organization; and that is the power to hold any office. This exceeds the men's privileges in the order, as there are four offices which can be filled only by women. I am acquainted with two women who are masters of subordinate Granges in this State. (The master is the highest office.) Although it has not been my good fortune to sit under their ruling, yet meeting them, listening to them address meetings and speak of business with clearness and conciseness, I know they would rule wisely and well. In 1891 the lecturer of the New York State Grange was a woman. We heard her deliver an address (assuredly not previously written), in a large auditorium, crowded with pleased listeners. Probably her own words will express her ability better than any I might choose.

It was summer. The doors and windows were open, and a brass band went marching past, making a perfect din; of course, she could not be heard and ceased speaking. After the band had reached the distance which lends enchantment, she explained "that she had always said she could out-talk everything but a brass band." She was fluent, lively, sparkling with wit and wisdom, and the Grange which has her name enrolled upon its books is rich. The Grange does good work for all, and the benefits accruing from it fall upon those who seek to destroy as well as upon those who aid.

It was through the Grange that the renewal of patents on sewing machines was prevented. It was through the Grange transportation companies were taught that the Creator was higher than the creature. It was mainly through grange efforts that the oleomargarine law was passed. It has passed laws somewhat restricting alien landlords and corporations from getting government land. It had the interstate commerce law passed. Had a cabinet position created for agriculture. Had some effect on local and State tax levies. Has established State Arbor day. Has caused the reform ballot law to be passed in many states. Has increased State appropriation for public schools. Has at all times fostered the cause of free education, besides local achievements, such as establishing banks, fire insurance companies, libraries and many co-operative enterprises. Writers, readers, speakers and parliamentarians, without number, owe their success to the Grange. All these benefits are the result of organization.—*Mrs. Emma L. Kenderdine Rice, Lumberville, Pa.*

STARTING AN ORCHARD.

When setting the tree, use the rich surface soil, and it cannot fail to make a good start. When young trees are taken from the nursery the roots are very much shortened, so in transplanting, the tops should be cut back in proportion. The apple tree will bear severe pruning. I have, in my experience, found it an excellent plan in starting young trees, to cut the top back to two or three buds on each branch, allowing these to grow until they get a good start, then prune those that are not needed. In this way, a person with good judgment will form a fine, uniform tree the first season. Some branches will be inclined to reach out too far at the expense of others. This is easily remedied at this time by pinching them off when they have reached a proper length. This will cause side shoots to start and form a bushy head; also will also throw some of the sap into the weaker branches.

The ground in a young orchard should be kept under cultivation with some hoed crop, using plenty of manure, spread broadcast, and worked into the soil so that the crop taken off, which will pay for the labor of cultivating the orchard, may not impoverish the soil. By constantly stirring the soil, the plant-food becomes loosened and the roots can more readily take it up, and the tree will make a more thrifty growth.—*George O. DeGraw, Factoryville, Pa.*

GRUMBLING.

Some people go about the world fretting and stewing constantly. They banish all happiness from the household, fill the atmosphere of their social surroundings with the cold clouds of discontent, render the burdens of life oppressive, and eradicate the better purpose of life and nobler aspirations of humanity. Do the best you can, but if you cannot attain the objects you aimed to accomplish, do not complain. If you cannot prevent reverses and evil consequences, do it cheerfully, but do not find fault and render others miserable where it can do no good. It is a worthy quality in any man or woman to labor diligently in the cause of right; but it is a no less worthy quality to govern the feelings in times of adversity. Worry has killed more people than hard work. The kind mother worries over a wayward son until her heart aches, and the "silver threads among the gold" proclaim the state of her mental anxiety more forcibly than pen can indite or tongue can utter. Its effect is seen in her shattered nerves and tottering footsteps. Many a mental wreck has been accomplished through gloomy suffering and worriment of this kind, which none but a fond mother's heart can know. Don't do it. It accomplishes no good, and brings a chilling gloom over your life and the lives of those who surround you. Never cross the bridge before you reach it. There never was a cloud so dark but that it had a silver lining. Look on the bright side of life, do your duty as your conscience tells you is right, hope for the best, and leave the result with God.

Some farmers labor diligently, are blessed with good health, never grumble or find fault, are good neighbors and citizens, and yet financial distress keeps them down continually. Others in the immediate vicinity do not labor as hard, suffer as many reverses, and yet they prosper financially, and get along well. Why is this difference? The

effect is apparent, let us seek the cause. The soil appears equally good, it is well cultivated, crops are good, and fences in repair. There must be a leakage somewhere; where shall we find it? We find the mowing machine and horse rake standing in the field where they were used last summer, and the paint is gone from the wood work and the rust is corroding the iron. Next year they will not work as well. Several small sums will have to be paid for repairs, and new machinery will have to be purchased before it is half worn out. The effect enters the pocket of the owner and little by little carries away his cash. We find the hoes rusty and weather-beaten among the weeds in the field where the boys had them early in the fall, digging potatoes, and when they are wanted at planting time next spring, they cannot be found, or if found, are broken by the cattle, or at best are unfit for use.—*Jasper T. Jennings, New Milford, Pa.*

CONSTRUCTING AND REPAIRING ROADS.

On hilly or rolling land, skill is required to get an easy grade and to prevent washing and gullies; but on level land it requires skill to get the water off and make a road that will stand wear. My experience has been on level land. The roadbed should be laid out wide, thirty-six feet is about right, leaving a margin of seven feet on each side for a foot path. This is for roads that are laid out fifty feet. The ditches should be from one and a half to two feet deep at the extreme outside and inclining upwards, rather steep for six feet, leaving twenty-four feet for road. I would have this just a little rounded in the centre and a little more incline as it nears the ditches, but not enough to make it unpleasant riding or traveling for the horse. Now, this is not theory, it is just what we have carried out in practice, not all over our township by any means, but in some portions of it, and we find that such a road wears much better and is kept in repair at less expense than one that is made narrower and is rounded up more.

Wide roads are much safer than narrow ones, especially when loaded teams have to pass each other. Suppose you have a load of hay and you meet a load of cheese boxes or other bulky material on a road that is narrow and high in the centre and sloping sides, then you have to exercise your best skill.

Sometimes you are out driving and have to watch both sides of the road at once to keep level; you overtake a team, the driver does not notice you, follow along impatiently a little while, when you call out, "Say, mister, won't you just drive into the ditch, so I can pass?" This is no imaginary trouble; it happens every day, while with a wide and nearly level road, you don't have to ask a man if he will please let you pass; you just drive along and sometimes you find out who has the best horse.

It probably costs a little more to make the wide road than the narrow, but when it comes to repairing, I think the wide road costs less, if the work is properly done. The road passing my place is a fair illustration of a wide road. In our district we have a mile and a half that we repair at one time. After a rain, or before the ground gets hard, we plow one furrow in the bottom of the ditch, put on two teams, set the plow to follow the near horse, and put him in the place where the furrow is to be. In this way we can keep the road full width, and

the team has a chance to walk. This plowing takes half a day. Then after it dries a little, we take the road scraper with three teams the first half-day; after that two teams and two men will do the work. There are no sods if this plan is followed every year. The dirt is mostly taken to the centre of the road, where it is smoothed off and finished with harrow and roller. The account stands thus: Three men and two teams, one-half day plowing; three men and three teams, one-half day road scraping; two men and two teams, one day road scraping; one man and one team, one-half day harrowing and rolling. Making ten and one-half dollars per mile per year to keep a road in good repair. This is exclusive of bridges and sluices. I think the State should aid in the construction and repairing of roads, as well as in supporting the schools. As it stands now, the farmers bear nearly all the burden.

It would be a great benefit to the roads if all who haul heavy loads could be induced or compelled to use broad tire; but there are times when broad tires make bad work, such as traction engines when the ground is soft, but then those engines could not travel over soft roads on narrow tires.—*Luther Gates, Beaver Centre, Pa.*

HOW TO IMPROVE COUNTRY ROADS.

In order to improve our country roads, three things are necessary. First, let there be a general awakening of the people in every township on this subject, and say we will have better roads. Second, select men for supervisors who know something about a road and have the backbone to see that they are built and maintained. Third, select men for pathmasters who can supervise the building of a road and who will see that every dollar credited to any man for work done on the road is earned. The township which starts out with this end in view, can have good roads, and that, too, without any additional cost in the matter of taxation.

But the stumbling block to success comes right in here, and as enterprising farmers, we must take the bull by the horns and get this block out of the way. The selection of men fit for supervisors, although not a hard thing to do, is not always done. Party affiliations may elect some man totally unfit for the place, and elect one who knows no more about roads, or how to build them, than a hog does about Latin. This is wrong; men should be chosen for these places who have the business which you want done in him. Bring the same principles into use in this work which you would in your own private affairs. No good business man would for a moment think of hiring a person to do work for him who, he knew was totally unfitted for the work.

The board of supervisors have a very important duty to perform in selecting the right kind of men to act as pathmasters. The pathmaster stands in the same position toward good roads that the teacher does toward good schools. Put a good teacher into the school room, and unless they are hampered in their work by a trainless school board and an ignorant lot of parents who are patrons of the school, and you will, in ninety-nine cases out of every hundred, have a good school. It is no less true with the pathmaster. He needs to know how to build a road, and how to handle men and teams to good advantage. He needs to have the necessary stamina to say to the man

who comes out on the roads with a hilling hoe upon which to lean while he talks politics, that he is not wanted on the road for that purpose. The man who comes out on the road with a pair of three-year-old colts, a pair of brood mares, barefooted, and totally unfit for such work as is necessary on the road, should have credit for what he does and no more. This will make enemies; but the man who cannot do this should not accept the duplicate. The man who shows a spirit of enterprise in himself on the road and his work, demonstrating that he is working for the public good, will soon live down any of these personal feelings engendered by doing his duty, as far as sensible men are concerned, and of others he should not care.

While a radical change in the construction of roads must necessarily lead to a great outlay of money, better roads than we now have can be had with no extra outlay of money; but there must be a change in the manner of building or working our roads. A bill has been prepared and will be presented to the present Legislature, taking the whole matter of the constructing and maintaining of country roads out of the hands of the townships or counties, and placing the whole road business in the hands of the State. Are we ready for such a move? Will such a system be profitable and practical for the taxpayer? I say taxpayer, because I do not believe that any other citizen or individual is entitled to consideration in the matter now before us. What effect is such a movement or change to have on us, as farmers, and other owners of real estate that are already paying the bulk of the taxes for the support of our different branches of government?

There is one thing connected with country roads upon which we can all agree, and that is that we need better roads. No class of people believe this or feel the want of it to a greater extent than farmers. If this be true, what can be done under the present system of working roads, if it can be called such, to secure better roads? It may be years before any law will be in existence different than the one we have for the building and maintaining of country roads. It may be that there will be no change until years after most of us who are here today have taken our departure from this world, hence the importance of action now. I believe that the American people are altogether too much addicted to demanding a change in the laws, as a remedy for bettering their condition. The laws which are on the statute books of either our State or nation would, if properly enforced, bring to the people health, prosperity and contentment. This will apply to roads as well as anything else.

The present laws for the building and maintaining of public roads comes just as close to the people as it is possible for anything to be. Each city, borough or township can have just as good roads as they desire. Now this, to some of you, may sound like strange doctrine; but it is true. The power of the road supervisors in the matter of roads is almost unlimited.—*H. M. Cutshall, Meadville*

DOES POULTRY RAISING PAY ?

In measuring an industry, the standard of dollars and cents is the one that should determine its value, as its sentimental phase will not in all cases be an incentive sufficiently strong to lead us onwards to success. Yet, it is but fair and proper to state that many of the most

prosperous and successful breeders of fancy poultry were lured into the business by its sentimental features; that is, possessing the proud distinction of owning and breeding the best thoroughbred stock in a community, and thus not alone realizing self-satisfaction as its fruit, but also succeeding in gaining reward in a pecuniary sense.

Success is not an accident, however, and in the poultry yard we receive as we give—give our poultry careful, intelligent attention, proper food and shelter, and the reply to the question, “does poultry raising pay?” will invariably be given in the affirmative. It is the too general prevalence of these opposite conditions that result in the absolute failure and consequent financial loss that very often casts odium upon this branch of agriculture. The stability of the poultry industry is fixed upon the basis of the progressive civilization of the age, and in this era of general prosperity, and with the present improved and excellent strains of poultry, there are comparatively few causes to operate against our efforts to succeed.

If we could but realize for a moment the many thousands of dollars that have been made by the farmers of Pennsylvania from this source within the past decade, we would observe a row of numerals that would not alone be startling in its magnitude, but also extremely gratifying. There are too many farmers who fare sumptuously on eggs in their various palatable forms, who never for a moment take time to think how much money they would necessarily expend, were they obliged to purchase this same healthful, strength-giving food. While the average farmer may claim that the hens are an unprofitable adjunct of the farm, the speaker is inclined to the belief that were their owner to keep a strict account, they would soon learn that poultry raising pays, and in all likelihood they will be surprised to learn that no other live stock on the farm has yielded such a large percentage of gain, compared with the capital invested and labor expended. This point will be especially strongly and clearly proven in the present epoch of unusually low prices for wheat and corn.

One of the most encouraging signs of the times consists in the fact that many farmers are disposing of the old, antique, dung-hill breeds, and substituting therefor the modern thoroughbred varieties. These will soon demonstrate that while they cost no more to keep, they are far more profitable. The egg-producing capacity is largely increased, and if the stock is choice and of a desirable variety or breed, it will not be long before the owner will have sale for breeding birds at prices more than five times in excess of those before realized from the huckster for the ordinary dung-hill fowls.

The speaker knows of a number of farmers who are breeding good strains of fancy poultry, who claim to realize a larger net income from that source than from the leading crop of cereals on the same farm.—*Oliver D. Schock, Hamburg, Pa.*

BEAUTIFY THE FARM.

Give your boys a chance to obtain that which is better than gold or silver—a good education. No one, in this age of progress, has better opportunity for study and improvement of the mind than the farmers' sons, and to none is culture more essential; and, although their hands

are callous and brown, their minds may be lustrous with intelligence, and with noble hearts and generous impulse they will thus be better able to live for God, the good of mankind, and the successful accomplishment of the great purpose for which they were created. Impress your boys with the fact that the farm is nature's great laboratory, and that much useful knowledge may be obtained by observation and communion with the many representatives of God's handiwork, with which they must constantly be associated in the performance of their daily avocation. Help them to grasp knowledge in its diversified forms. Begin in childhood to unveil the beauties, attractions and mysteries of nature's handiwork. The beautiful birds whose joyous songs greet us in the morning open a page in natural history. The delightful flowers with gorgeous colors and sweet-scented fragrance unfold a chapter in botany. A pebble gathered from the purling brook gives food for a talk in geology. The unattractive qualities of the soil call up the subject of chemistry. Their own wonderful mechanism affords ample material for several talks upon the subject of hygiene, physiology and anatomy. Thus, in a simple, common sense manner, the various sciences may be taught to our boys, leaving off technical words until they have formed a love for knowledge, so that they will wish to delve deeper into these wonderful mines of wealth. Physical training in their early youth is pre-eminently important. Teach your boys to develop their muscles as well as culture their minds, polish their manners and improve their morals. Have a little home gymnasium, and here instruct them how to run, jump, use Indian clubs or light dumb-bells, calisthenic exercises, and in a hundred ways bring the ruddy flush to their cheeks, and cause the rich blood to course rapidly through a healthy body. Many do not think of physical training, and others may oppose it and say their boys will have enough exercise on the farm. In after years they may, but in the tender years of their lives such is not the fact. The farmer who wishes to win the grand prize in an agricultural contest would not expect to win unless he paid special attention to the improvement and physical care of the animal he exhibits. Shall we do less for our boys who bear within them the germ of immortality? I am in favor of a thorough discipline of the mind, so that the boys from the country may lead as in days of yore. It is not best to stand idly by and allow others from the learned professions to occupy all the places of honor and trust; let the farmers have a voice, and let it be heard in our legislative bodies and halls of Congress in the future, more than at present, and our interests will be better protected. And now, mothers, I wish to say to you, that when you teach your boys that little prayer, "Now I lay me down to sleep," teach them patriotism, loyalty to their homes, their country and their God. Tell them of the toils, trials, temptations and sacrifices of our forefathers who devoted their lives to this glorious country of the stars and stripes, that their children and their children's children might enjoy the most perfect form of government ever devised by human hands. Tell them of the many institutions of civil and religious liberty that we, the people of the United States, enjoy, and that are unknown to other lands. Interpret to them the fundamental principles of our American institutions that make this country pre-eminently great, and that must be perpetuated. Encourage your boys to read the history of the lives, emu-

late the virtues, of the many great men who have contributed so much to give unto us the most glorious home upon God's footstool: "A government of the people, by the people, and for the people." *eorge Hopwood, Uniontown, Pa.*

THE IDEAL POTATO CROP.

Speaking of an ideal potato crop, it is a somewhat indifferent term, after all; to one it may mean no more than one hundred bushels to the acre, while to another, with a higher standard of attainment, with a clearer conception of the needs of his soil, and a knowledge of the possibilities of the crop when the necessary conditions are present, it may mean anywhere from six to twelve hundred bushels. Having now a congenial soil, preceded by congenial crops, the next consideration is that of plant food; and here I expect severe criticism. I should unhesitatingly apply my stable manure to the corn and grass lands, and buy for the potato crop a complete fertilizer containing not less than five per cent. ammonia, eight per cent. phosphoric acid, and ten per cent. potash. By the term complete fertilizer I refer to a fertilizer containing all the essential elements of barnyard manure, in contradistinction to the so-called phosphates containing practically nothing but phosphoric acid; of this high grade complete fertilizer, I should apply not less than one thousand pounds per acre, and if I could see the way clear, fifteen hundred pounds would be a good investment, the ground to be sown, after the potatoes were removed, with winter grain, and seeded down to grass, from which profitable crops may be cut for two years without further treatment. As to the manner of applying the fertilizer, I have found nothing better than a good grain drill, the surface finished with Acme or smoothing harrow, and we are ready to mark out. On a large scale the grower will plant in drills, using the Aspinwall planter, but on the small scale, nothing has given me better satisfaction than the Planet, Jr., with cultivator teeth removed and an eight-inch shovel in centre, with marking attachments; excellent work can be done where the nature of the soil will permit; the same tool can soon be arranged to cover the sets by using two horses and finishing the ends by hand. I should prefer to plant about four inches deep. Should the indications point toward hot, dry weather immediately after planting, I should roll the ground at once to conserve moisture. My seed should be selected from sound, healthy tubers, rather above the medium in size, cut in two parts, and one piece planted in a hill, because in this ideal crop I prefer to grow a maximum crop at a minimum of expense. To do this I must use "more horse and less man," assuming also that the small grower for whom this is mainly intended will dig his crop by hand. The labor of digging is facilitated by planting in hills. The after cultivation should consist of stirring the soil after heavy rains, keeping the soil mellow and loose and growing more shallow as the crop approaches maturity. I have found that, other things being equal, two feet nine inches each way is a proper distance to plant.

If I have calculated rightly, there should be about fifty-nine hundred hills to the acre, and if fourteen hills would produce a bushel, we would then have a product of four hundred and twenty bushels per acre, a fairly satisfactory yield. I have dug a bushel from twelve hills the field over.—*M. Garrahan, Kingston, Pa.*

BEAUTY IN RURAL HOMES.

The beauties of a rural home are not alone visual. Upon the mind and heart are engraven impressions received from rural life which are lasting. Nature is a wonderful teacher. She trains the imagination, instructs the artistic sense, cultivates poetic instinct, gives health to the body, thus beautifying and strengthening the mind. Great pictures, splendid poetic thoughts, great prose efforts are not based on the scenes of city life, but are the triumph of rural scenes and descriptions thereof. Bryant does not, in *Thanatopsis*, find anything to describe in city life to teach his lesson of immortality. He speaks of the oak, of the insensible rock, of the great river which heaves no sound save its own laughing. Longfellow, in his *Evangeline*, dwells on the beauty of the rural home and country life. He speaks of the beautiful woodland, of the oak, beneath which the weary plowman stops to rest, of the cot surrounded by a garden of roses, of the beautiful meadow and broad expanse of water, whose every ripple sounds like laughter answering the wail of the forest.

How much inspiration can there be to the poet or painter in city life? How much there is in rural life, that is shown by the volumes and descriptions thereof. The evils of city life are not found in a rural home. Here, free from the wearing discord of urban life, the mind develops and broadens, the body invigorates itself for the triumphs of educational life. Almost, with but few exceptions, the truly great men of our nation, men in poetry, painting, science, invention and statesmanship, were country boys. The foundations of these triumphs of great men and great minds were laid in the pure, sweet air and sunshine of rural life.

The birds, the flowers of the field, the woodland, the beauteous and wondrous changes of the seasons, the phenomena of all creation are here; nature's heart is visible at every pulsation. In the city, however beautiful it may be, in some respects it is invariably artificial. It has no phenomena which country life has not. Who has not felt a pang of pity when he observed the city child enjoy for the first time the sunshine of the fields; when he picks with eagerness, not unmixed with wonder, the yellow stars in a sky of green, the homely dandelion. Herein, under the open sky, in the sunshine, surrounded by vastness of space and loveliness of landscape, why should not the mind grow great for success in after life?—*Miss Mame L. Reynolds, Scranton, Pa.*

INTENSIVE FARMING.

Intensive farming does not mean making a specialty of raising any particular crop and nothing else. In conversation recently with one of the most successful farmers, he said emphatically, "Raise a little of everything that you possibly can." I would improve upon the advice by saying, raise as much of everything as you possibly can without overcrowding. Raise as many crops (excepting weeds) on the same ground, in the same season, with one application of manure as possible. Two years ago I planted one-fourth of an acre in early potatoes; as soon as we were done working the potatoes, we planted tobacco between the rows of the potatoes. When the potatoes were

dug for market, the stalks were carried off and the ground cultivated, when the lot had the appearance of a tobacco field. It was then sown with turnip seed and after the tobacco was taken off, it was a complete turnip field. The result was fifty bushels of potatoes, average price one dollar per bushel, fifty dollars; four hundred pounds of tobacco at twelve cents, forty-eight dollars; forty bushels of turnips at thirty cents a bushel, twelve dollars; total, one hundred and two dollars, or about as much as would be realized at present prices from five acres of corn at eighty bushels per acre, or seven acres of wheat, or four acres of hay. And yet the taxes were paid for only one-fourth of an acre. This, in my opinion, was intensive farming.

The best crop of corn that I ever raised was grown on a four-acre lot on which the second growth of the previous year's clover crop was left stand and then plowed down. The ground was thoroughly prepared before planting, for I hold to the theory that ground cannot be prepared after the crop is planted. The field was checkrowed or marked two ways, and the corn planted very thickly, and after it was cultivated eight or ten times with a cultivator, we went over the field and thinned down every hill to not more than three stalks. I do not think there was a vacant hill in the field. The result was six hundred bushels of corn ears (one hundred and fifty bushels per acre). Six large two-horse loads of corn-fodder and half a dozen loads of pumpkins, equal to about as much as is ordinarily raised on twice the number of acres. The next year the same field produced a little over two hundred bushels of oats.

In preparing ground for wheat seeding, I don't think that too much use can be made of the roller and the spring-toothed harrows. If the ground can be put in such a condition that there is not a lump or clod on it larger than a hen's egg, and the surface stones all taken off, it is much more reasonable to expect a good crop, all other conditions being equal, than if the land were covered with clods or stones. If the soil is covered with stones or clods, seed cannot grow, and you lose the same large proportion of your labor, seed and harvest. You know that it worries your team and yourself as much to plow your ground for a poor crop as a good one.—*C. J. Wasson, Cedar Springs, Pa.*

CARE OF MILK.

Let us go back a little and see, as we come up to the present time, what has been the greatest step in advance the dairy interest has taken. Perhaps some of you can remember when nothing was thought fit to set milk in but stone crocks or jars, great, heavy, clumsy things. My earliest recollection of milk setting are long rows of eight-quart tin pans, and the cream removed from them with skimmers and left in large tin cream pails to sour before churning. Then came the large, shallow milk vats from which the cream was removed with skimmers; then the deep-setting, large tubs set in cool water to facilitate the raising of the cream; next came the Cooley creamer with its submerged can of milk and the various creameries with their refrigerator plans, by which the cream was raised and the milk drawn from it, leaving a very thin cream, which required nearly double the amount of churning. Then came what we believe to be the most complete

system yet, that of the centrifugal separator, which does the work perfectly at all seasons of the year, and does not leave any cream in the milk, but yields a rather thin cream like the Cooley system.

So, step by step, we have had improved methods of separating the cream from the milk, but each plan leaves the cream in the care of each individual housewife to ripen and churn, and you have just as many kinds of butter as there were different women or men to make it, and each one has to market their own butter, and is not satisfied because they do not realize as much as they expected.

The introduction of the separator was by far the greatest step in progressive dairying, not only in the work of separating the cream, but it brings with it the possibility of progressive butter-making. We do not mean to say that progress has not been made by the individual, but mean co-operative butter-making on the factory plan, when the cream from all the different farms instead of being made into as many grades of butter at as many different prices, shall all be No. 1, and sell all together and every one will get the highest price for his share as it shall all be first quality. In our neighborhood, as well as you in this vicinity, we have a butter factory which turns out butter of the highest quality, and to us the problem seems much like the examples we used to have in the old arithmetic at school. If two men can with one engine, two separators and two churns make up the milk from one hundred dairies in one day, how much time will one hundred men with one hundred small separators, and one hundred small churns, consume in doing the same work, and how much other expense for fixtures must they assume, and how much other work might they have accomplished in the same time? We know in our own case it consumes time we had much rather employed in some other way, and we do not believe it will pay, ordinarily, for farmers to buy one hundred and twenty-five dollar separators and other things in proportion, to do all this work at home, even if they could manage to save the price paid the factoryman for making it. The chances are he will have to pay it out again and more with it, hiring help, or paying doctor bills for his wife or himself.—*Mrs. C. A. Stranahan, Spartansburg, Pa.*

HOLSTEIN CATTLE FOR GENERAL PURPOSES.

Having made the claim that the Holsteins are a general purpose breed of cattle, let us see what evidence we can produce to prove the statement.

First, we will say, they are the acknowledged milk producers of the world. Cows of this breed, with milk records from eighty pounds per day, number in the thousands, while there are hundreds with records of ninety pounds and upwards, and those with daily records of from one hundred to one hundred and twenty-two and one-half pounds, are by no means scarce. Several two-year-old heifers have daily records of from sixty to seventy-four and one-half pounds, and those of this age with yearly records of from 13,000 to 17,746 pounds would fill a volume, while the greatest milk production stands at the door of Pictorje, and who gave in three hundred and sixty-five days, 30,318½ pounds, one hundred and twelve pounds for seven successive days. This being over twenty times her own weight, and as will be seen, it is

over three five-ton car loads. We will here leave the milk and look into the butter-producing qualities of the Holsteins.

In looking up statistics we find that it is no uncommon thing for two-year-old heifers to produce from two to three pounds of butter per day, while aged cows, with records of from eighteen to twenty pounds per week are as plenty as flies in a kitchen on a July day. Several have reached from twenty-five to thirty-five pounds in seven days, and Mechtchilde, at six years of age, produced six pounds and two ounces in one day, thirty-nine pounds and ten and one-half ounces in seven days, one hundred and fifty pounds and eight ounces in thirty days, two hundred and ninety-two pounds and five ounces in sixty days. Mercedes won the challenge silver cup offered by the "Breeder's Gazette" of Chicago, for the largest thirty-day butter record, open for one year to July 1, 1883, to all breeds and the world, beating the then Jersey Queen, "Mary Ann," of St. Lambert, making ninety-nine pounds and six and one-half ounces. It was also a Holstein cow, Clothchilde, that won the beautiful silver pitcher with a Jersey cow embossed upon it, offered by the president of the American Jersey Cattle Club, at Madison Square Garden, New York city, for the cow producing the largest amount and best quality of butter; but the crowning jewel in the diadem was reached when the world's butter queen, Pauline Paul, completed her year's test and gave to the world the unprecedented record of 1,153 pounds and fifteen and three-fourth ounces of butter in three hundred and sixty-five days, requiring sixteen pounds and three and one-half ounces of milk to the pound of butter.—*B. B. Lord, Sinclairville, N. Y.*

CARE OF FARM ANIMALS.

My own practice in feeding is about as follows: A feed of hay and grain in the morning; at noon the cows are turned out to water, the stable is cleaned and bedded, the cows are tied up and given oat-straw, followed in the evening with corn-fodder and grain. The grain feed consists of corn ears and oats, ground together. About four quarts are given at each meal, morning and evening, and one quart when they are tied up at noon. It would probably be better to sell part of the corn and buy coarse bran, linseed or cotton-seed meal to mix with the remaining corn. One of the most satisfactory rations for cows and fattening steers I ever used, was composed of one bushel of cotton-seed meal mixed with three bushels of corn chop.

In summer, good pasture, supplemented with corn-fodder in August and September when the pastures are getting short, is all I have found necessary. If your pastures are not too far from the barn, turn your cow out at night; it will pay in the comfort of the cows and the increased flow of milk. A cow will eat more at night than in daytime, when the weather is hot and the flies are bad. But keep them in the yard or stable as soon as the frosty nights come and feed some hay, fodder, pumpkins, soft corn or anything that will keep up the flow of milk and yield of butter. Frozen grass is very poor feed. While there may not be much of a falling off in milk, yet the quantity of butter will be decreased very materially.

Young cattle should have plenty of rough feed and some grain in the winter and pasture in summer. Sheep should have upland pas-

ture in summer, early-cut clover hay, oat straw and grain in winter. My experience is that sheep can be kept as well and at less cost on straw and hay for the rough feed as on hay only. Give them enough straw in the morning so that they can pick out the best and use the remainder for bedding. In the evening, give them grain and all the hay they will eat up clean, and no more. Feed about one pint of grain to each sheep per day. Let your grain consist of corn and oats, fed whole. If your stock consists of breeding ewes, and you have no clover hay, let the grain ration be oats, or oats and bran. Avoid constipation, as it is to be specially guarded against in sheep. If you wish to raise early lambs, commence to feed the ewes grain in August. The increased number and strength of the lambs will amply repay the extra grain consumed. Where one person has the care of all the animals on the farm, the sheep should be fed last in the morning and first in the evening.—*N. H. Esh, Spruce Hill, Pa.*

PROGRESS OF VETERINARY SCIENCE.

Animals are exempt from some diseases common to human beings. For example, the horse rarely suffers from toothache; the nerve does not approach so near the crown as in man. Again, animals are generally exempt from numerous diseases which man produces in himself by the use of alcoholic stimulants. On the other hand, fat and over-pampered animals suffer from liver disease as well as man. The veterinary medical art differs from human medical art. First, animals can give but little assistance in diagnosing diseases. Information can only be gleaned by symptoms. Herein the veterinarian is placed at a disadvantage as compared with the medical man; hence greater skill in the diagnosis of disease is needed in the veterinarian than in the medical man. Second, in regard to the effect of medicine and treatment, the veterinarian must rely solely upon his skill in discerning its effects. He cannot ask his patient the effect which his medicine is producing. Hence, we are obliged to wait until some result has been obtained either for good or for worse. In the human subject, the medical man would ascertain from his patient what effect was being produced. This again shows that greater skill is needed in the veterinarian than in the medical man. Third, it is seldom worth the while to treat serious injuries in animals. For instance, a horse breaks his leg. Bones will reunite in animals as easily as in man, but complete restoration to soundness cannot always be expected in either one or the other. A medical man is often well enough pleased if he can make his patient well enough to walk about, in case of a fracture of a leg, while a horse will not repay the cost of cure unless he can be restored to perfect soundness. Hence, serious fractures are seldom treated. But fractures of non-weight bearing bones may be and are frequently treated with success; but such cases demand special care on the part of the veterinarian, as the animal, from ignorance of the nature of the treatment adopted, and from impatience and perhaps irritation, is apt, unless great care is taken, and the restraints most accurately adjusted, to destroy, in a few seconds, all the results of care and treatment of weeks.

Lastly, the disadvantage with which the veterinarian has to contend in the treatment of disease are greater than those of the medical

man. He is seldom called in in the earliest stage of the disease. This is due partly to ignorance and to the incapacity of those in charge of animals to recognize the earlier signs of disease; partly to the stupid desire to save a fee, to wait and see if the animal will not get well of itself; and, lastly, to the inability of the unfortunate sufferer to speak for itself. Animals cannot, except by silent expression or uneasy actions, tell their grievances or sufferings, or explain their sensations. Again, in stables generally, there is an absence of those accessories of comfort which are absolutely necessary in the successful treatment of animals, as in man. Good nursing in many diseases is half the battle.
—*Dr. C. R. Good, Lock Haven, Pa.*

HOW TO BUILD A PIGEON LOFT.

I will endeavor to describe a suitable building for one hundred pairs of pigeons. First, select a spot with enough elevation to secure dryness—the south side of a hill being preferable. Plant six posts in the ground a sufficient depth that they may be solid, with the tops extending a foot out of the ground. A foundation of this kind is considered better than a wall, because it leaves no place for rats to harbor. Make the building twenty-four feet long, twelve feet wide and thirteen feet high at the north side, with a shingle roof sloping south. This is high enough for a two-story building—the upper story to be used for nests, and the lower for a mating room, feed room and a convenient place to have a stove, making a comfortable place to dress squabs in cold weather.

The sides of the building should be made of matched lumber. The north side, where the boxes are to be made, should also be lined with felt paper in order to exclude the wind and cold.

The floor should also be made with matched boards. The lower floor, especially, should be made intact; tin should be nailed over any crevice where there remained any possibility of rats gaining entrance.

The upper story or lofts should be divided into two parts to hold fifty pairs each. The division should be a passageway two feet wide, with steps coming from the room below. At the top of the steps, doors should open from the passageway into each room. In constructing boxes for nests, commence at the floor; cut boards ten feet long, which will reach from the passageway to the end of the house. Make the boxes nine inches high and twenty inches wide by partitions; cut nine inches one way by twelve the other. Each one of these twenty-inch spaces must again be divided by boards cut nine inches each way. This double box is intended for one pair of pigeons. One side will contain squabs while the female bird will have a nest of eggs in the other. Now take lumber one-half an inch in thickness and three inches wide, cut in proper length to extend from the top to the bottom of the boxes and fasten at the division between each set of boxes. This is intended, in a degree, to prevent male birds from fighting around the sides of the boxes. Also use the same kind, long enough to reach from the end of the building to the passageway; fasten it along the upper side of each row of boxes in order to partly enclose them.

Windows should be made at the east and west end of the building

to admit light and for ventilation. Make outlets on the south side of the building.

A fly thirty-two feet long, twelve feet wide and ten feet high, made out of two-inch mesh wire netting, will also be needed when birds are not given their liberty. Water should be kept handy. An oil barrel cut in two about four inches from the end, makes a suitable water tub. Pigeons are very fond of bathing and should be well supplied with water for this purpose. This is one of the important essentials of keeping them in a healthy condition. Ground salt, ground bone and oyster shells must be furnished them when enclosed.

When selecting a place for a house in an outbuilding, have it face towards the south, make the enclosure ten feet long and construct boxes as in house No. 1.

Make a window on the south side and a door at either end. A house constructed on the plan just mentioned can be built at a comparatively small cost.

A location for a house near a stream is a very important factor in the business, as it always affords them plenty of pure water.—*Edward R. Kirk, Pineville, Pa.*

FARMERS' CLUBS AND EXPERIMENT STATIONS.

There ought to be a good newspaper report prepared at the close of every meeting of every club in Bucks and Montgomery counties. These reports ought to be as short and concise as possible, and should be mailed promptly to all the local newspapers. In length they might vary from the contents of a postal card to that of one foolscap sheet. It might be well to mail the reports regularly to a few of the leading agricultural periodicals, as well as the local newspapers. All editors are glad to have them, provided they are concise and prompt.

No better form of minutes could be kept by the secretary of a club than the terse form of report here suggested; and for newspaper use many duplicate copies could be made by the secretary at a single writing by one of the several multiple processes now upon the market.

In reading the reports of the meetings of the Horsham club and the several clubs of Bucks county, I have noticed the high degree of character and ability displayed by the men and women who take a prominent part of the proceedings, and confess that at times I have felt a twinge of regret and almost of resentment against our national economic laws, because it seems that American farmers have not been full sharers in our marvelous general prosperity. Farms in eastern Pennsylvania and elsewhere have been going down in price, and the boys seek the towns and cities. These conditions must somehow be changed for the better. I have no "cure-all" to suggest. I can only hope for better times. There are thinking men in America today who believe that the farming of the future must be done by a peasant class, and who assume such a view when they discuss the ethics of political economy.

Of course, an idea of that kind cannot prevail with safety, because our national purity and strength depend, to a great extent, upon the intelligence and the patriotism of the rural population. Heart and brain must ever come from the soil. The farm must supply the brain which the city wastes. Farm life conserves nerve force, while town

life destroys it. It is increasingly true, under our excessively active American life, that the city worker must, every few generations, return to the soil for new blood, new muscle, new brain and new nerve; and to deny this asylum to exhausted American families, is to doom them to extinction, and to turn the country over to the ownership of foreigners and aliens. Whole neighborhoods have been thus changed in social character within the memory of men still young, and I suppose it is thus that the opinion has gained ground that our farming must inevitably pass under the control of a peasant class; a class fitted by European experience to out-work and out-starve the old-fashioned American farmer.

It must be admitted that the peasant has set foot upon American farm land, but it can be truthfully claimed that the American public school is capable of converting an illiterate peasantry into an intelligent yeomanry. Nor is the original American stock yet wholly driven to the wall by the depressed condition of agriculture, and it is not yet too late to effect a change for the better.

Perhaps the strongest ally of the American farmer, in his struggle with the alien for possession of American soil, is the modern agricultural experiment station. There were people who thought that the appointment of a farmer to a place among the advisers of the President was a boon or gift intended to please the rural population of the country; that it was merely a sop or bone tossed to a clamorous dog. Now we see that the creation of the agricultural portfolio was a most dignified and happy event, from which has flowed a stream of good consequences. The country now admits, and almost every state and territory has ratified the admission that the public prosperity is vitally concerned in the question of intelligent and profitable agriculture. Experiment stations, well supplied with both brains and money, have sprung up all over the United States.—*S. Edward Paschall, Doylestown, Pa.*

PRODUCING PURE AND WHOLESOME MILK.

To produce pure and wholesome milk, there are a number of things to be taken into consideration and closely watched and lived up to.

The first thing to be done is to procure a good, healthy cow, one that is rightly put up for the business for which you want her. With an unhealthy cow you cannot expect to get a good, wholesome article of milk, butter or cheese, no matter how well you may feed, water or care for the cow; nor does it matter how well you may care for the milk, or treat it; you cannot make a pure and wholesome article of food from an unhealthy cow.

Second. To make pure and wholesome milk it is important to have pure, unadulterated food and pure water for the cow, for it is one of the impossibilities to make a pure and wholesome milk out of impure food and water, as they do not undergo any manner of purification after it is taken into the stomach, until it is converted into milk. As milk is a secretion and not a circulation, consequently the milk in a great measure, if not altogether, partakes of the same nature of the food and water; hence the importance of pure food and water.

Third. It is an old saying that "cleanliness is next to godliness." With a dirty cow, and dirty, badly-lighted and ill-ventilated stable,

you need not expect to get a pure and wholesome article of milk. I don't care how well you may feed and water your cow, or how good a cow you may have, it is an impossible thing to get a good, healthy life or growth of either animal or vegetable matter without good light and sunshine, and plenty of pure air to breathe; and without it you cannot have a good healthy cow, and without a healthy cow you cannot have good, wholesome milk.

Fourth, is the aeration and cooling of the milk. The aeration of milk on the farm by a new machine especially adapted to the work, is a new invention and appliance in American dairying. I wish to say right here that every good, live, wide-awake, progressive farmer, who wishes to keep himself in the front ranks of producing good, pure and wholesome milk, will not be without a milk aerator and cooler. I know it is extremely difficult to convince the ordinary dairyman that it is to his interest to use an aerator and cooler, without an appeal to direct experiment. Milk is never in so good a condition for treatment as when it is warm and fresh from the cow. An aerator and cooler applied at this time will remove all animal odor and take out all germs of fermentation, putrefaction and decay. It will leave the milk inodorous and agreeable to the taste. Milk dealers have discovered this, finding their customers appreciating the change of the flavor and general improvement in the condition of the milk. Milk so treated is vastly more healthy and digestible by delicate stomachs and by children, and will keep nearly two days longer than milk not so treated. Every milk dealer knows very well the misery of caring for milk that has not been properly treated at the farm.—*B. C. Mitchell, Brandywine, Pa.*

NATURE'S LESSONS.

Some of nature's lessons are so easy that he who runs may read; so there is no excuse upon the part of any one for entire ignorance of her laws, facts and phenomena; and we should not allow a day to pass without gathering some new truth or beautiful thought with which to enrich the mind. There is no object, either animate or inanimate, but from which we can learn some useful lesson. Even the ant and spider teach lessons of energy, indomitable courage and perseverance, and it is certainly interesting to watch their habits and methods. Perhaps, from a close study of the life and habits of so uncanny a thing as the snake, there might be revealed lessons in morality which would put to shame the machinations of some of those of the human form.

The flowers, yes, the flowers we so love to mingle with and cultivate—emblems of the true, the beautiful and the good—they have a mission to perform, and nobly do they perform it. To the appreciative they are eloquent. They awaken an answering chord of sympathy in the hearts of mankind, and their frailty, purity and modesty teach lessons that are never forgotten. They are to be found everywhere and the world is tenfold more beautiful for their presence. It is said that every flower contains a poem, could we but extract it. Wordsworth emphasizes this sentiment in the following lines:

“Thanks to the human heart by which we live,
Thanks to its tenderness, its joys and fears,
To me the meanest flower that blooms can give
Thoughts that do often lie too deep for tears.”

Some philosophers would teach us that there is rhyme and melody in the movements of leaves; that the limbs of trees, swayed by the wind, form a perfect circle, or arc of a circle; that exactness and symmetry are everywhere preserved. However these things may be, much good discipline might be acquired in the efforts to prove or disprove these assertions.

Nature continually presents to us beautiful pictures, which the highest art, at its best, can only approximate. In the springtime she is aglow with beauty, and furnishes lessons of tireless industry and joyful labor in expectation of the rich harvest of summer and autumn, and of the development of the richest possibilities of our intellectual and spiritual natures; for the mission of the beautiful is to purify our desires, lift us to a higher plane and ennoble our souls.— *Carrie B. Paxson, Solebury, Pa.*

FARMERS' BOYS.

If the period of our school days, during which our attention was directed to the study of the arts and sciences, have not been applied in subsequent life, the fault is not theirs, but ours. If the chemical and astronomical experiments and knowledge we gained by such a course of study, have not been applied in our industry, the fault is not theirs, but ours. If the very analysis of the soil, informing us of its component elements, and therefrom deduced a knowledge of its needs, have not been turned to our advantage, the fault is not theirs, but ours. In short, we have either not gained the knowledge we should, or we have failed to turn it to proper account. The failure to do so is very much to our discredit. The live, active farmer has other and equally important duties to perform besides those of sowing and reaping. There are brains to be cultivated, no where more needed than on the farm. On this point of preparation for the farm by course of study and practice, our own and other states recognize the importance of such preparation, and, with this object in view, have established agricultural colleges, linking together theory and practice, and accomplishing a most desirable purpose. Again, and aside from these institutions, the press furnishes us today with a class of literature on farming eminently superior to any age preceding ours. A class of literature which, if searchingly and studiously read, would lead us to think more as well as to think better of our profession. So as to conferences of all kinds which farmers may, and in many localities do hold purely in the interests of farming. They are the exception, however, rather than the rule. While there are local and state, as well as a National Association, yet farmers, as a whole, are the least organized of any class of people in the world. They are, therefore, not in the best position to draw from and communicate to each other the stimulus which gives force and effect to every project. Neither are they in the best position to have their rights and privileges duly regarded. Society on the farm, between families in the same neighborhood, might be made to elevate the standard of intelligence which in itself would contribute largely to make farm life more attractive and enjoyable than is the case in the absence of such a factor of refinement. It would, we think, go far toward arresting the growing tendency of farmers' sons to follow more attractive and more exciting pursuits in

life, which annually draws from the farm brain we can ill afford to lose. Better, young man, be content with your lot. Better labor to adorn your profession on the farm by an employment of brain and brawn than to trust to the uncertainties of a profession which, though seemingly your ideal of distinction in the world, may, perchance, be full of dangerous pitfalls. There is nothing more honorable, nothing more noble, nothing more elevating in itself than the cultivation of the soil. It seems to me the creature is brought more closely to the Creator than through any other medium or pursuit. Comparing our advantages with those of our forefathers, we must confess, with some degree of shame, our wastefulness. We have been more extravagant than our ancestry. We have not been content with the plain, simple; luxury and extravagance are calculated to reduce, by that much, our net revenue. I mean extravagance and luxury as opposed to parsimony. To live within one's means is a lesson we must each of us learn individually, if it is learned at all. The same inclination to extravagance will result detrimentally to any business.—*M. W. Bahm, New Freedom, Pa.*

GRAPE GROWING.

Never use manure next to the roots; put it on the surface after planting, where it will act as a fertilizer and will protect the young vine in a dry and hot summer and retain moisture. I have often used old shoes, bones and leather scrap in filling in with good results.

We all know that the future growth, health and productiveness of a vine depends very much on its getting a good start. Good culture should be given. Weeds and grapes will not thrive together. The soil should be frequently stirred with a rake or hoe. Wood ashes mixed with the soil is a very good fertilizer.

It is a bad policy to plant too closely, as bad results will follow with vines, as with trees, if they have no room to develop their fruit and foliage. The Concord, Ives and other rank-growing kinds should be planted eight feet apart. The Delaware, Lady and some other slow-growing kinds will do well by planting from four to six feet apart.

As a rule, elevated land should be chosen for a vineyard, so that you will have natural drainage; a southeastern slope is considered the best. I prefer a clay soil, slightly mixed with gravel.

The most important point in grape culture, in my opinion, is pruning and training. If we expect to raise grapes, either for profit or pleasure, we should raise first-class fruit, uniform in size and quality. The health of the vine must be looked after, if you wish them to bear annual crops. This it cannot do with all the help that nature can give. Without judicious pruning and retaining of the fruit-bearing shoots from year to year, you will not succeed. It is natural for the vine to climb to the highest part of its support. Its growth of wood is more rapid when climbing than when in a horizontal position.

When setting out a vine, the young shoots should be tied to a stake until they are sufficiently developed to begin to bear fruit, which should not be later than the third season after planting. The growth of the vine is upwards and it is not likely to bear fruit until it takes the horizontal position. It is then when its fruiting power becomes fully developed. You will notice that shoots having an upright position

will always make the most vigorous growth at the highest points, and the young shoots starting below will be of feeble growth. The buds remain dormant, leaving the stock bare to where it spreads its branches, be it three or ten feet from the ground. For this reason it is important to prune and train in such a manner as not to have any portion of the arms or fruit-bearing cane, or spurs, higher on the trellis than others. If this plan is carried out, the proper equality between wood and fruit is more easily maintained. This is of great importance, though but little practiced. If heeded, you will have equal distribution of sap to all parts of the vine, and uniform growth of wood and fruit.—*M. T. Donmoyer, Kutztown, Pa.*

POTATO GROWING THAT PAYS.

If we are near enough a market to deliver them by wagon loads, we might grow a dozen different kinds and take a load of one kind every time; but, if we are so located that we have to ship them in car lots, we should not have too many kinds, unless we are very extensive growers, and can fill a car with one or two kinds, as it would be too much work and expense to build partitions to prevent a mixture.

Do not cast away good, old kinds too soon and blame them for deteriorating when probably your lack of attention has deteriorated more than the kinds you condemn. A friend of mine told me that the Early Rose had run out and urged me not to risk any more chances on that kind; but, nevertheless, I planted them freely, with a return of 250 bushels per acre. I know a man that cuts and plants potatoes the size of hickory nuts and marbles, because he can sell the larger ones, and his kinds all deteiorate rapidly, and he seldom has any choice ones, unless in a year when he has bought seed of a matured growth from his neighbor.

This should not be. Do we seed our meadows with timothy chaff? Do we shell corn from nubbins to plant? Do we save our wheat screenings to sow to raise a good crop of the staff of life? Why, then, would we plant the poor, little, immatured potatoes and expect good returns?

Under proper conditions and treatment, the Early Rose will yield well, and if you keep track of them in the markets, you will find they are no laggards. Whatever kinds you plant, always select those that are good yielders and good table potatoes, unless you live near to a starch factory and have some enormous croppers.

In cutting potatoes for seed, two points should be considered; whether the object is to raise an abundant crop in order to gain large returns from the land you plant, or whether the motive is to gain a large fold from a certain amount of seed planted. If the former is the object in view, take potatoes from medium to large size, cut a small slice off the sprout end, which do not plant, unless at a time of extreme scarcity, then split the potato in two, lengthwise. The object is to have large pieces with few eyes, in order that the plant will have plenty to sustain it while the roots are gaining a good hold in the ground. Too many sprouts means an overplus of strings, and the result is a multitude of unsalable potatoes at the expense of what might have been a fine crop. If an abundant fold is desired from a small amount of seed, start at the string end and cut off single-eyed pieces

till you have cut up the whole potato; now you are ready for planting. Drop one piece in a hill and cover with four inches of fine soil, being very careful not to leave flat stones over them. Last year I planted three potatoes the size of a hen's egg which were planted under very unfavorable conditions. They were of the Early Freeman kind, and the returns from them was one bushel and ten pounds. Just before the plants begin to come through the ground, go over them with a spike-tooth harrow, the team straddling the row, and if done right, the ground will be clean, both space and hill. The cultivator should be run deep and often, so long as there is no danger of disturbing the strings. Crusts should not be allowed to remain any longer than practicable after a rain has fallen. Your reward will be in proportion to the labor and attention you give them. A man that is sparing with work will never succeed in potato-growing.—*J. C. Mossfo v Hazzard, Pa.*

COUNTRY LIFE.

Years ago when a boy or girl strayed away from rural life to attend college, on returning to their country homes a sense of shame, rather than pride, took possession of them, and why? Eyes were being trained to see, ears could now discern discord and the beautiful law of the eternal fitness of things began to make its force felt, while that divine discontent that is the keynote of all progress, began to prompt to immediate action. New houses were built, old ones remodeled, shade trees were planted and thoughtful parents soon discovered that a little money could be wisely expended for that which is "neither meat nor raiment," and labor dignified by a set purpose could transform a bleak, cheerless place into a home that is the dearest spot on earth. Money can never purchase what well-directed toil can accomplish; willing hands and a fertile brain and an artist's soul have made many an old-fashioned, gloomy country home a veritable paradise. An ordinary board fence or rough paling, whitewashed, are in striking contrast with the vivid green meadow and hillside. It is no easy task to pull weeds, but once removed from the soil, the grass springs up like magic. Rubbish is removed and that nuisance, where the germs of fever and diphtheria are so often found, and in solution—that ill-smelling abomination so often found in the door yard of the farmer of "ye olden time," the slop barrel, is banished and its contents carried from kitchen and dairy to the pig trough in buckets. We no longer see roses blooming in the front yard while ashes and slops make the rear filthy and unsightly. Every nook and corner are thoroughly clean and covered with grass and adorned with trailing vines and blooming bowers that gives an air of taste and respectability to the humblest dwelling. This spirit of adornment that pleases the eye, and cultivates the taste, enters the country home, be it cottage or mansion, and makes every spot bright and cosy. House plants blooming in midwinter, sweet-voiced birds in cages, a musical instrument, some standard books, a good magazine, local and denominational papers, choice selections in literature for young people, a few games; these are not costly in time or money, but they educate and elevate, they bring culture, refinement and pleasure into our country homes, make their inmates the equal, often the superior of the city bred.—*Mrs. Dr. W. H. Parry, Higbee, Pa.*

SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN DURING THE YEAR 1893, AT THE
OFFICE OF THE WEATHER BUREAU, UNITED STATES DEPARTMENT OF AGRICULTURE,
HARRISBURG, DAUPHIN COUNTY, PENNSYLVANIA—377 FEET ABOVE SEA LEVEL.

BY MAJOR FRANK RIDGWAY, Observer United States Weather Bureau and Meteorologist of the Board.

	Average pressure of the atmosphere by the barometer / inches and tenths.	TEMPERATURE.			PRECIPITATION.		WEATHER.			REMARKS.
		Highest.	Lowest.	Average.	In inches and hundredths.	Number of days rain or snow fall.	Clear.	Partly cloudy.	Cloudy.	
January,	30.02	45	4	31	2.06	8	6	14	11	Highest barometer pressure, 30.85, December 14, 1893.
February,	30.28	52	7	29	4.68	13	6	8	14	Lowest barometer pressure, 30.25, January 1, 1893.
March,	30.09	65	11	36	1.97	10	10	9	12	Highest temperature, 96 degrees, June 30, 1893.
April,	30.06	71	33	49	3.67	14	8	10	14	Lowest temperature, 4 below zero, January 16, 1893.
May,	29.92	86	41	59	5.32	16	10	6	15	Total snow for year, 46.4 inches.
June,	30.02	96	54	71	2.46	12	10	7	13	Rain and melted snow for 1893, 41.74 inches.
July,	29.96	88	55	75	1.92	12	13	10	8	Rain and melted snow for 1894, 30.07 inches.
August,	29.98	95	54	73	3.69	9	13	8	10	Rain and melted snow for 1895, 42.63 inches.
September,	30.07	86	41	63	1.74	10	9	9	12	Rain and melted snow for 1896, 43.40 inches.
October,	30.13	82	28	56	3.25	9	13	7	11	Rain and melted snow for 1897, 39.65 inches.
November,	30.15	59	22	40	2.54	10	2	10	9	Rain and melted snow for 1898, 35.18 inches.
December,	30.17	63	16	33	1.91	12	2	7	14	Rain and melted snow for 1899, 35.18 inches.

LIST OF COUNTY AND LOCAL AGRICULTURAL SOCIETIES,

With Names and Addresses of Secretaries and Dates of the Fall Exhibitions of 1893, compiled from official reports and sources by the Pennsylvania Board of Agriculture.

[Those marked with an * are represented in the Board of Agriculture by elected members.]

COUNTY.	Corporate Name of Society.	Name and Address of Secretary.	Where Held.	When Held.
	PENNSYLVANIA STATE AGRICULTURAL SOCIETY.	J. Schall Wilhelm, Harrisburg.	Indiana,	September 11-15.
	STATE HORTICULTURAL ASSOCIATION,	E. B. Engle, Waynesboro',	Holds no fair.	No fair.
	GRANGERS' INTERSTATE EXPOSITION,	R. H. Thomas, Mechanicsburg.	Williams' Grove.	Aug. 24-Sept. 2.
	MT. GRETNA FARMERS' ENCAMPMENT AND INDUSTRIAL EXH.	Dr. S. P. Hellman, Hellmandale,	Mt. Gretna,	Aug. 21-26.
	PATRONS OF HUSBANDRY EXHIBITION,	George M. Boal, Centre Hall,	Centre Hall,	Sept. 18-23.
	CONNEAUT LAKE EXPOSITION,	Col. Frank Mantor, Manager, Evansburg,	Conneaut Lake,	Aug. 22-29.
	POMONA GRANGE EXHIBITION AND PICNIC,	O. S. Kimball, Westfield,	Wellsboro',	Sept. 13-15.
Adams,*	Adams County Agricultural Association,	D. Toot, Table Rock, . . . . .	. . . . .	Holds no fair.
Allegheny,*	Tarentum Agricultural and Driving Park Association,	J. L. Moore, Tarentum,	Tarentum,	Aug. 29-Sept. 1.
Armstrong,*	Dayton Agricultural and Mechanical Association,	P. M. Enterline, Dayton,	Dayton,	Sept. 23-29.
Do.	Parker Agricultural Association,	R. Balf, Parker's Landing,	Parker,	Sept. 12-15.
Do.	Armstrong and Westmoreland Driving Park Association,	W. J. Guthrie, Apollo,	Apollo,	Sept. 19-22.
Beaver,*	Beaver County Agricultural Society,	F. Dawson, Beaver,	Beaver,	Sept. 28-30.

Beaver,*	Mill Creek Valley Agricultural Society.	R. M. Swaney, Hookstown.	Hookstown.	August 22-24.
Bedford,*	Bedford County Agricultural Society.	T. S. Giehrst, Bedford.	Bedford.	Sept. 26-29.
Berks,*	Berks County Agricultural and Horticultural Society.	Cyrus T. Fox, Reading.	Reading.	Sept. 12-15.
Do.	Keystone Agricultural Society.	J. B. Esser, Kutztown.	Kutztown.	Sept. 19-21.
Blair,*	Blair County Agricultural Society.	C. H. Porter, Hollidaysburg.	Hollidaysburg.	Sept. 12-15.
Bradford,*	Bradford County Agricultural Society.	Arthur Coddling, Towanda.	East Towanda.	Sept. 26-29.
Do.	Union Agricultural Association.	C. D. Derrah, Canton.	Canton.	Sept. 19-22.
Do.	Troy Farmers' Club.	J. R. Vannoy, East Troy.	Troy.	Sept. 12-15.
Bucks,*	Doylestown Agricultural and Mechanical Institute.	J. E. Zorns, Doylestown.	Doylestown.	No fair.
Butler,*	Butler County Agricultural Society.	Ira McJunkin, Butler.	Butler.	Sept. 5-8.
Cambria,*	Cambria County Agricultural Association.	J. V. Mancher, Carrolltown.	Carrolltown.	Oct. 3-6.
Do.	Ebensburg Fair Association.	E. James, Ebensburg.	Ebensburg.	Sept. 18-21.
Carbon.	Carbon County Industrial Society.	E. Bauer, East Mauch Chunk.	Lehighton.	Sept. 12-15.
Centre,*	Centre County Agricultural Society.	John Kline, Howard.	Belleville.	No fair.
Chester,*	Chester County Agricultural Society.	B. Lear, West Chester.	West Chester.	Aug. 31-Sept. 2.
Do.	Oxford Agricultural Society.	C. P. Marindale, Oxford.	Oxford.	Sept. 29-29.
Clarion,*	Clarion County Agricultural Society.	J. H. Patrick, Clarion.	Clarion.	Sept. 19-22.
Clearfield,*	Clearfield Park Association.	Matt Savage, Clearfield.	Clearfield.	No fair.
Do.	Clearfield Agricultural Park Association.	R. H. Shaw, Clearfield.	Clearfield.	Sept. 18-21.
Clinton,*	Clinton County Agricultural Society.	J. R. Porter, Mackeyville.	Cedar Springs.	No fair.
Columbia,*	Columbia County Agricultural Society.	A. N. Yost, Bloomsburg.	Bloomsburg.	October 10-14.
Do.	Northern Columbia and Southern Luzerne Agricultural Society.	J. G. Jacoby, Berwick.	Berwick.	October 4-7.
Crawford,*	Crawford County Agricultural Society.	J. E. Rupert, Conneautville.	Conneautville.	Sept. 18-15.
Do.	Cochranon Agricultural Society.	J. H. Adams, Cochranon.	Cochranon.	Sept. 6-8.

AGRICULTURAL SOCIETIES—Continued.

COUNTY.	Corporate Name of Society.	Name and Address of Secretary.	Where Held.	When Held.
Crawford.	Oil Creek Valley Agricultural Association.	C. M. Hayes, Titusville.	Titusville.	Sept. 5-8.
Do.	Central Crawford Agricultural Society.	H. E. Carrigan, Cambridge.	Cambridgeboro.	Sept. 19-22.
Cumberland.*	Cumberland County Agricultural Society.	W. H. McCrea, Carlisle.	Carlisle.	Sept. 26-29.
Dauphin.	Graz Driving Park and Agricultural Society.	J. W. Hoffman, Gratz.	Gratz.	Sept. 12-15.
Do.*	Agricultural Society of Dauphin County.	G. Hiester, Harrisburg.	Harrisburg.	Holds no fair.
Elk.	Elk County Agricultural Society.	J. P. Hall, St. Mary's.	St. Mary's.	No fair.
Erie.*	North Western Agricultural Society.	J. D. Bentley, Corry.	Corry.	Sept. 12-15.
Do.	Wattsburg Agricultural Society.	A. S. Phelps, Wattsburg.	Wattsburg.	Sept. 5-8.
Do.	Edinboro' Agricultural Society.	P. W. Tucker, Edinboro.	Edinboro.	Sept. 26-29.
Payette.*	Payette County Agricultural Association.	W. C. McKean, Uniontown.	Uniontown.	Sept. 5-8.
Franklin.*	Franklin County Farmers' Association.	D. Z. Shook, Greencastle.	Greencastle.	Holds no fair.
Fulton.*	Big Cove Agricultural Society.	W. C. Patterson, McConnellsburg.	McConnellsburg.	No fair.
Greene.	Greene County Agricultural Society.	J. L. Clawson, Carmichaels.	Carmichaels.	Oct. 4-5.
Do.*	Waynesburg Central Agricultural Society.	R. F. Downey, Waynesburg.	Waynesburg.	No fair.
Huntingdon.*	Cool Run Agricultural Society.	John M. Wight, Franklinville.	Franklinville.	Holds no fair.
Indiana.*	Indiana County Agricultural Society.	John S. Taylor, Indiana.	Indiana.	Sept. 11-15.
Jefferson.*	Jefferson County Agricultural Association.	A. D. Long, Brookville.	Brookville.	Sept. 28-29.
Do.	Punxsutawney Agricultural Association.	H. W. Mundorf, Punxsutawney.	Punxsutawney.	No fair.
Junata.*	Junata County Agricultural Society.	W. R. Wharton, Port Royal.	Port Royal.	Sept. 6-9.

Lackawanna.*	Lackawanna County Agricultural Society.	G. A. Jessup, Scranton.	Scranton.	Sept. 12-15.
Do.	North Lackawanna Farmers' Association.	J. L. Stone, Waverly.	Waverly.	No fair.
Lancaster.*	Lancaster County Agricultural Society.	John G. Rush, West Willow.	Lancaster.	Holds no fair.
Lawrence.*	Lawrence County Agricultural Society.	W. J. Brown, New Castle.	New Castle.	Aug. 29-Sept. 1.
Lebanon.*	Lebanon Valley Agricultural and Mechanical Association.	J. H. Ulrich, Lebanon.	Lebanon.	No fair.
Lehigh.*	Lehigh County Agricultural Society.	L. P. Hucker, Allentown.	Allentown.	Sept. 25-29.
Luzerne.	Luzerne County Agricultural Society.	M. L. Perrin, Pittston.	Exeter Borough.	No fair.
Do.*	Dallas Union Agricultural Society.	J. F. Garrahan, Dallas.	Dallas.	Oct. 4-5.
Lysoming.*	Muncy Valley Farmers' Club.	J. A. S. Small, Hughesville.	Hughesville.	Sept. 26-29.
McKean.	McKean County Agricultural Society.	C. W. Catlin, Port Allegany.	Port Allegany.	Sept. 12-15.
Mercer.	Mercer County Agricultural Society.	J. P. Hines, Stoneboro.	Stoneboro.	Sept. 26-29.
Do*	Mercer Central Agricultural Society.	W. J. McKean, Mercer.	Mercer.	Sept. 12-14.
Mifflin.*	Mifflin County Agricultural Society.	A. J. Hamblin, Lewistown.	Lewistown.	Dec. 26-28.
Monroe.*	Monroe County Agricultural Society.	T. C. Brown, Stroudsburg.	Stroudsburg.	Sept. 5-9.
Montgomery.*	Montgomery, Berks and Chester Agricultural Society.	E. P. Ancona, Pottstown.	Pottstown.	Oct. 8-6.
Montour.*	Montour County Agricultural Society.	W. K. West, Danville.	Danville.	Sept. 26-30.
Do.	Northern Montour Agricultural Society.	C. E. Shires, Washingtonville.	Washingtonville.	No fair.
Northampton.*	Northampton County Agricultural Society.	J. J. Maus, Nazareth.	Nazareth.	October 3-6.
Do.	Farmers' and Mechanics' Institute.	T. H. Hay, Easton.	Easton.	No fair.
Do.	Bethlehem Fair and Driving Park Association.	H. A. Groman, Bethlehem.	Bethlehem.	Sept. 18-23.
Northumberland.*	Milton Driving Park and Fair Association.	W. P. Hastings, Milton.	Milton.	Oct. 3-6.
Do.	Shamokin Agricultural and Driving Park Association.	A. G. Marr, Shamokin.	Shamokin.	Aug. 16-19.
Perry*	Perry County Agricultural Society.	F. A. Fry, Newport.	Newport.	Sept. 19-22.
Potter	Potter County Agricultural and Horticultural Society.	L. E. Larrabee, Coudersport.	Coudersport.	Sept. 26-29.

AGRICULTURAL SOCIETIES—Continued.

COUNTY.	Corporate Name of Society.	Name and Address of Secretary.	Where Held.	When Held.
Schaykill,	Schaykill County Agricultural Society.	G. H. Yeager, Orwigsburg.	Orwigsburg.	Sept. 6-8.
Do.	Ringtown Agricultural Society.	I. Applegate, Shenandoah.	Ringtown.	Aug. 30-Sept. 1.
Do.	Mahanoy Valley Agricultural Association.	Frank Rentz, Ashland.	Lavelle.	Aug. 22-24.
Sullivan,*	Sullivan County Agricultural Society.	F. Newell, Dushore.	Forksville.	Oct. 2-4.
Susquehanna,*	Susquehanna County Agricultural Society.	W. A. Tinsworth, Montrose.	Montrose.	Sept. 26-27.
Do.	Harford Agricultural Society.	E. E. Jones, Harford.	Harford.	Oct. 4-5.
Tioga.	Cowanesque Valley Agricultural Society.	John R. Denzle, Westfield.	Westfield.	Sept. 18-22.
Do.*	Tioga County Agricultural and Mechanical Industrial Assoc'n.	J. A. Elliott, Mansfield.	Mansfield.	Sept. 28-29.
Union,*	Union County Agricultural Society.	G. E. Long, Lewisburg.	Lewisburg.	Sept. 28-29.
Venango,*	Venango County Agricultural Society.	J. Miller, Franklin.	Franklin.	No fair.
Warren,*	Warren County Fair Association.	Willis Cowan, Warren.	Warren.	Sept. 12-15.
Washington,*	Western Pennsylvania Agricultural Association.	A. G. Happer, Washington.	Washington.	Aug. 29-Sept. 1.
Do.	Union Agricultural Association.	W. Melvin, Burgettstown.	Burgettstown.	Oct. 2-5.
Wayne,*	Wayne County Agricultural Society.	W. M. Gardner, Honesdale.	Honesdale.	Sept. 28-29.
Westmoreland*.	Westmoreland County Agricultural Society.	Dr. L. T. Smith, Greensburg.	Greensburg.	Sept. 5-8.
Wyoming,*	Wyoming County Agricultural Society.	E. J. Jordan, Tunkhannock.	Tunkhannock.	Sept. 30-22.
York,*	York County Agricultural Society.	E. Chaplin, York.	York.	Oct. 2-6.
Do.	Hanover Agricultural Society.	M. O. Smith, Hanover.	Hanover.	Sept. 12-15.

LIST OF LOCAL FARMERS' INSTITUTES, 1892-1893.

COUNTIES.	Location.	Date.	Managed By
1. Adams.	Acadtsville.	Jan. 10-11.	I. Garretson, Biglerville.
2. Adams.	York Springs.	Feb. 14-15.	I. Garretson, Biglerville.
3. Armstrong.	Dayton.	Dec. 16-17.	D. W. Lawson, Dayton.
4. Armstrong.	Kittanning.	Jan. 5-6.	D. W. Lawson, Dayton.
5. Bedford.	Everett.	Jan. 17-18.	S. S. Diehl, Bedford.
6. Bedford.	Bedford.	Mar. 1-2.	S. S. Diehl, Bedford.
7. Berks.	Kutztown.	Feb. 1-2.	G. D. Stitzel, Reading.
8. Blair.	Bellwood.	Feb. 14-15.	Fred. Jaekel, Hollidaysburg.
9. Bradford.	Troy.	Feb. 8-9.	Louis Molett, Wyoar.
10. Bucks.	New Hope.	Dec. 1-2.	E. Reeder, New Hope.
11. Bucks.	Langhorne.	Feb. 1-2.	E. Reeder, New Hope.
12. Butler.	Butler.	Jan. 17-18.	W. H. H. Riddle, Butler.
13. Centre.	Centre Hall.	Jan. 24-25.	J. A. Woodward, Howard.
14. Centre.	Rebersburg.	Jan. 26-27.	J. A. Woodward, Howard.
15. Chester.	Coatesville.	Jan. 11-12.	S. R. Downing, Goshenville.
16. Chester.	Phoenixville.	Jan. 13-14.	J. O. K. Roberts, Phoenixville.
17. Clarion.	Clarion.	Dec. 15-16.	W. Shanafelt, Brinkerton.
18. Clearfield.	Curwensville.	Feb. 1-2.	E. M. Davis, Gramplan Hills.
19. Clearfield.	Mahaffey.	Feb. 3-4.	E. M. Davis, Gramplan Hills.
20. Clinton.	Beech Creek.	Dec. 22-23.	J. A. Herr, Cedar Springs.
21. Clinton.	Salona.	Mar. 2-3.	J. A. Herr, Cedar Springs.
22. Clinton.	Lama.	Feb. 7-8.	J. A. Herr, Cedar Springs.
23. Columbia.	Millville.	Feb. 9-10.	Chandlee Eves, Millville.
24. Columbia.	Berwick.	Jan. 17-18.	Chandlee Eves, Millville.
25. Crawford.	Beaver Centre.	Feb. 20-21.	Luther Gates, Beaver Centre.
26. Cumberland.	Mechanicsburg.	Nov. 30 & Dec. 1.	R. H. Thomas, Mechanicsburg.
27. Dauphin.	Harrisburg.	Jan. 25-26.	G. Hlester, Harrisburg.
28. Dauphin.	Harrisburg.	Feb. 21-22.	G. Hlester, Harrisburg.
29. Dauphin.	Gatz.	Jan. 19-20.	A. L. Wales, Corry.
30. Erie.	Corry.	Mar. 2-3.	G. Hopwood, Unlontown.
31. Fayette.	Unlontown.	June 8-9.	
32. Franklin.	Greencastle.	Dec. 14-15.	D. Z. Shook, Greencastle.
33. Franklin.	Greencastle.	Oct. 19-20.	D. H. Patterson, McConnellsburg.
34. Fulton.	McConnellsburg.	Dec. 13-14.	B. F. Herrington, Winesburg.
35. Greene.	Graysville.	Dec. 7-8.	G. W. Musser, Fillmore.
36. Huntingdon.	Warriors Mark.	Oct. 26-27.	N. Seannor, Plumville.
37. Indiana.	Indiana.	Dec. 28-29.	N. Seannor, Plumville.
38. Indiana.	Marion Centre.	Mar. 10-11.	N. Seannor, Plumville.
39. Indiana.	Indiana.	Dec. 13-14.	J. McCracken, Jr., Frostburg.
40. Jefferson.	Baxter.	Jan. 11-12.	J. McCracken, Jr., Frostburg.
41. Jefferson.	Punxsutawney.	Feb. 22-23.	D. E. Robinson, Port Royal.
42. Juniata.	East Waterford.	Jan. 3-4.	H. H. Colvin, Dalton.
43. Lackawanna.	Dalton.	Jan. 5-6.	H. H. Colvin, Dalton.
44. Lackawanna.	Moscow.	Sept. 7-8.	Calvin Cooper, Bird-in-Hand.
45. Lancaster.	Black Barren Springs.	Sept. 9-10.	Calvin Cooper, Bird-in-Hand.
46. Lancaster.	Ruttland Park.	Feb. 22.	Calvin Cooper, Bird-in-Hand.
47. Lancaster.	Mount Joy.	Feb. 1-2.	S. McCreary, Neshamock Falls.
48. Lawrence.	Pulaski.	Feb. 23-24.	S. McCreary, Neshamock Falls.
49. Lawrence.	Rose Point.	Aug. 19.	C. R. Lantz, Lebanon.
50. Lebanon.	Mount Gretna.	Jan. 16-17.	Dr. J. P. Barnes, Allentown.
51. Lehigh.	New Tripoli.	Jan. 10-11.	J. P. Smith, Kingston.
52. Luzerne.	Huntington Mills.	Jan. 12-13.	J. P. Smith, Kingston.
53. Luzerne.	Luzerne Boro'.	Mar. 7-8.	Abner Fague, Picture Rocks.
54. Lycoming.	Hughesville.	Dec. 28-29.	R. McKee, Mercer.
55. Mercer.	Mercer.	Feb. 22-23.	R. McKee, Mercer.
56. Mercer.	Mercer.	Apr. 8.	R. McKee, Mercer.
57. Mercer.	Mercer.	Jan. 20-21.	J. B. Shannon, Lewistown.
58. Mifflin.	Lewistown.	Dec. 28-29.	J. Q. Atkinson, Three Tuns.
59. Montgomery.	Hatboro.	Feb. 7-8.	T. L. Clapp, Limestoneville.
60. Montour.	Washingtonville.	Feb. 28-Mar. 1.	T. L. Clapp, Limestoneville.
61. Montour.	Mooresburg.	Oct. 4.	B. B. McClure, Bath.
62. Northampton.	Nazareth.	Jan. 18-19.	B. B. McClure, Bath.
63. Northampton.	Nazareth.	Feb. 2-3.	John Hoffa, Milton.
64. Northumberland.	Rushtown.	Feb. 9-10.	John Hoffa, Milton.
65. Northumberland.	Milton.	Mar. 7-8.	John Hoffa, Milton.
66. Northumberland.	Northumberland.	Jan. 4-5.	D. Kistler, Kistlers.
67. Perry.	New Bloomfield.	Feb. 9-10.	D. Kistler, Kistlers.
68. Perry.	Millerstown.	Jan. 31-Feb. 1.	N. B. Critchfield, Jenner's x Roads.
69. Somerset.	Somerser.	Mar. 9-10.	J. K. Bird, Millers.
70. Sullivan.	Forksville.	Feb. 14-15.	R. S. Searle, Montrose.
71. Susquehanna.	Montrose.	Feb. 16-17.	R. S. Searle, Montrose.
72. Susquehanna.	Hanford.	Apr. 19-20.	R. S. Searle, Montrose.
73. Susquehanna.	Jackson.	Feb. 7-8.	J. A. Gundy, Lewisburg.
74. Union.	Lewisburg.	Mar. 13-14.	J. A. Gundy, Lewisburg.
75. Union.	Hartleton.	Feb. 23-24.	Porter Philipps, Kennersdell.
76. Venango.	Franklin.	Mar. 22-23.	Charles Lott, Warren.
77. Warren.	Warren.	Feb. 3.	J. McDowell, Washington.
78. Washington.	Canonsburg.	Jan. 31-Feb. 1.	N. F. Underwood, Lake Como.
79. Wayne.	Hamilton.	Feb. 2-3.	N. F. Underwood, Lake Como.
80. Wayne.	Tyler Hill.	Dec. 21-22.	J. Nichols, Bradenville.
81. Westmoreland.	Greensburg.	Dec. 21-22.	Dr. W. S. Roland, York.
82. York.	Wrightsville.	Dec. 23-24.	Dr. W. S. Roland, York.
83. York.	Stewartstown.	Jan. 27-28.	Dr. W. S. Roland, York.
84. York.	Dillsburg.		

PENNSYLVANIA FARMS, 1880-1890.

COUNTIES.	Number of farms in 1880.	Number of farms in 1890.	Increase in number over 1880.	Decrease in number compared with 1880.	COUNTIES.	Number of farms in 1880.	Number of farms in 1890.	Increase in number over 1880.	Decrease in number compared with 1880.
Adams,	3,614	3,396	..	278	Lackawanna,	1,707	1,679	..	128
Allegheny,	5,590	5,343	..	187	Lancaster,	9,070	9,440	870	..
Armstrong,	4,026	4,127	101	..	Lawrence,	2,696	2,575	..	61
Beaver,	2,653	2,672	19	..	Lebanon,	2,476	2,400	..	76
Bedford,	3,240	3,220	..	20	Lehigh,	3,546	3,378	..	168
Berks,	6,847	6,952	105	..	Luzerne,	2,957	2,850	..	107
Blair,	1,536	1,490	..	46	Lycoming,	3,452	3,352	..	100
Bradford,	6,658	6,415	..	243	McKean,	1,207	1,460	253	..
Bucks,	6,493	6,364	..	129	Mercer,	4,855	5,021	186	..
Butler,	5,384	5,364	20	..	Mifflin,	1,131	1,143	12	..
Cambria,	2,437	2,241	..	196	Monroe,	1,774	1,767	..	7
Cameron,	244	339	95	..	Montgomery,	6,114	5,361	..	753
Carbon,	889	982	93	..	Montour,	858	814	..	44
Centre,	2,400	2,180	..	220	Northampton,	4,004	3,395	..	608
Chester,	6,116	6,119	3	..	Northumberland,	2,534	2,361	..	173
Clarion,	3,147	3,115	..	32	Perry,	2,493	2,314	..	155
Clearfield,	2,750	2,812	62	..	Philadelphia,	730	901	21	..
Columbia,	1,108	1,162	54	..	Pike,	869	960	91	..
Crawford,	2,629	2,415	..	214	Potter,	2,100	2,128	28	..
Cumberland,	7,444	7,786	342	..	Schuylkill,	2,805	2,680	..	125
Dauphin,	2,983	2,944	..	39	Snyder,	1,900	1,667	..	233
Delaware,	2,702	2,677	..	25	Somerset,	3,393	3,471	78	..
Elk,	1,683	1,469	..	214	Sullivan,	926	958	32	..
Erle,	718	759	41	..	Susquehanna,	4,814	4,716	..	98
Fayette,	5,579	5,483	..	96	Tioga,	4,469	4,552	83	..
Forest,	3,251	3,320	69	..	Union,	1,305	1,224	..	81
Franklin,	296	491	192	..	Venango,	2,808	3,054	246	..
Fulton,	3,602	3,295	..	307	Warren,	2,696	2,881	185	..
Greene,	1,294	1,305	11	..	Washington,	4,481	4,514	33	..
Huntingdon,	2,900	2,924	24	..	Wayne,	3,586	3,659	73	..
Indiana,	2,579	2,391	..	188	Westmoreland,	5,389	5,339	..	50
Jefferson,	4,438	4,644	206	..	Wyoming,	1,647	1,732	85	..
Juniata,	2,576	2,531	..	45	York,	7,327	7,730	403	..
	1,772	1,609	..	163					

Total, 1880, 213,542 farms.

Total, 1890, 211,577 farms.

Decrease, 1,965

VALUES OF FARMS AND PRODUCTS, 1880-1890.

COUNTIES.	Total value of farms, including land, fences and buildings, 1880.	Total value of farms, including land, fences and buildings, 1890.	Increased valuation.	Decrease in valuation.	Estimated total value of farm products, 1880.	Estimated total value of farm products, 1890.
Adams,	\$14,386,576	\$11,702,920		\$2,683,656	\$1,846,430	\$1,801,340
Allegheny,	40,411,956	47,079,330	\$6,667,374		3,695,167	4,380,880
Armstrong,	13,577,865	12,376,767		1,200,898	1,771,272	1,485,170
Beaver,	12,506,009	13,707,310	1,111,301		1,412,812	1,659,560
Bedford,	9,975,163	9,223,864		751,299	1,269,110	1,300,490
Berks,	30,989,274	33,375,610		3,613,064	4,485,551	4,310,210
Blair,	8,805,772	6,732,620		2,163,152	1,031,856	1,020,350
Bradford,	22,916,557	20,171,450		1,745,106	4,138,391	3,423,550
Bucks,	36,151,968	30,489,270		5,962,688	5,960,056	5,411,870
Butler,	20,644,143	20,056,386		587,758	2,244,838	2,030,770
Cambria,	6,213,058	6,852,230			368,185	800,870
Cameron,	609,820	677,010	689,172		131,530	115,670
Carbon,	2,487,175	2,708,820	221,645		341,263	456,956
Centre,	12,634,448	9,058,030		3,576,418	1,524,401	1,504,540
Chester,	30,217,513	36,983,210		2,534,303	5,970,229	5,868,800
Clarion,	10,375,428	9,284,110		1,091,318	1,204,075	1,217,830
Clearfield,	8,088,943	9,247,540	1,158,597		1,201,299	1,160,450
Clinton,	5,304,751	4,458,720			787,086	770,910
Columbia,	7,833,876	7,414,020			1,424,247	1,049,198
Crawford,	21,200,040	22,361,815	1,660,875		3,274,800	3,125,770
Cumberland,	19,776,990	16,226,440			2,507,572	2,078,340
Dauphin,	15,914,915	15,182,470			1,865,462	2,047,030
Delaware,	18,437,510	15,136,170			2,538,164	1,909,400
Elk,	1,450,598	1,346,070			235,049	249,110
Erie,	21,618,618	21,031,100			3,028,290	2,900,490
Fayette,	20,270,434	19,735,250			1,758,011	1,655,840
Forest,	603,490	963,530	60,040		113,833	166,280
Franklin,	19,542,673	16,782,670			2,624,574	2,584,680
Fulton,	2,496,621	2,337,545			500,681	367,000
Greene,	13,748,657	15,652,620	1,903,962		1,434,089	1,563,410
Huntingdon,	8,536,461	7,410,365			1,280,708	1,207,800
Indiana,	13,533,462	15,068,940	1,514,819		1,810,501	1,834,720
Jefferson,	7,311,371	8,401,270	89,899		933,144	975,890
Junata,	6,314,374	5,116,270			816,385	709,390
Lackawanna,	6,343,348	6,426,050	83,602		937,538	976,880
Lancaster,	69,004,919	58,800,190			10,144,229	7,657,790
Lawrence,	12,040,772	10,608,130			1,342,642	1,354,560
Lebanon,	17,146,008	14,014,780			3,131,828	1,544,430
Lehigh,	17,977,977	16,462,840			2,416,815	2,157,780
Luzerne,	12,695,779	10,164,780			2,530,960	1,442,250
Lycoming,	13,833,435	13,366,710	533,275		1,552,785	1,007,200
McKean,	3,424,549	3,559,160	134,611		513,066	536,520
Mercer,	20,414,614	18,505,350			2,342,200	2,001,650
Mifflin,	8,013,491	6,336,670			918,446	872,720
Monroe,	5,095,275	4,304,060			747,275	786,010
Montgomery,	36,688,001	39,617,980	2,929,270		6,086,078	4,733,310
Montour,	3,788,009	3,516,940			485,321	629,710
Northampton,	18,405,898	15,857,380			1,970,349	2,105,140
Northumberland,	11,006,245	10,180,940			1,532,211	1,535,750
Perry,	8,478,217	6,949,730			1,170,397	1,128,000
Philadelphia,	13,633,460	15,632,770	1,999,310		1,434,240	1,212,920
Pike,	2,391,038	2,721,900	330,207		277,575	329,870
Potter,	4,341,945	5,331,650	989,705		881,941	909,610
Schuylkill,	9,829,946	9,536,640			1,432,827	1,522,870
Snyder,	6,061,350	5,365,090			861,822	858,470
Somerset,	11,858,391	11,736,250			1,788,943	1,815,000
Sullivan,	2,154,096	2,300,140			389,674	452,170
Susquehanna,	13,479,029	12,458,160			2,358,126	2,335,980
Tioga,	13,550,131	13,501,522			2,462,739	2,187,900
Union,	7,705,281	6,873,970			326,591	834,920
Venango,	7,966,538	8,134,680	178,142		1,122,371	1,185,280
Warren,	7,719,618	7,006,540			1,175,339	1,082,120
Washington,	35,284,957	34,093,540			3,671,369	2,109,370
Wayne,	8,392,507	8,423,470	30,963		1,419,816	1,406,290
Westmoreland,	30,550,823	33,481,515	2,930,692		2,907,171	2,968,540
Wyoming,	5,671,915	5,429,890			818,741	803,530
York,	31,142,021	26,908,015			4,623,232	4,623,030
Total,	\$975,689,410	\$922,240,238			\$129,760,476	\$121,838,848

PRICES OF FARM PRODUCTS—MAY, 1893.

COUNTIES.	Wheat, per bushel.	Corn, per bushel.	Rye, per bushel.	Oats, per bushel.	Potatoes, per bushel.	Hay (clover), per ton.	Hay (timothy), per ton.	Butter, per pound.
Adams,	80 68	.42	.56	.34	80 60	88 00	\$12 00	.19
Allegheny,	75	.70	.90	.45	1 00	13 00	18 00	.28
Armstrong,	75	.53	.62	.42	75	10 50	12 00	.26
Beaver,	85	.50	.60	.40	75	8 00	10 00	.25
Bedford,	80	.55	.65	.45	75	8 00	12 00	.28
Berks,	75	.52	.58	.40	1 00	12 50	16 00	.28
Blair,	75	.55	.60	.40	90	12 00	15 00	.25
Bradford,	85	.60	.65	.45	65	9 00	12 50	.26
Bucks,	75	.50	.60	.40	1 00	12 00	14 00	.25
Butler,	75	.55	.60	.43	80	12 00	15 00	.25
Cambria,	90	.65	.70	.47	1 00	12 00	16 00	.28
Cameron,	87	.60	.75	.48	1 00	13 00	15 00	.26
Carbon,	78	.58	.70	.45	90	12 00	14 00	.25
Centre,	70	.50	.56	.35	65	10 00	14 00	.25
Chester,	70	.50	.60	.40	85	12 00	15 00	.33
Clarion,	70	.60	.60	.45	80	10 00	12 00	.25
Clearfield,	80	.60	.70	.50	90	14 00	16 00	.25
Clinton,	75	.55	.65	.42	80	12 00	14 00	.30
Columbia,	72	.54	.60	.38	90	10 00	12 00	.25
Crawford,	75	.55	.65	.40	80	12 00	14 00	.30
Cumberland,	70	.43	.50	.32	80	7 00	11 00	.22
Dauphin,	80	.50	.56	.43	95	16 00	18 00	.25
Delaware,	80	.60	.60	.40	90	14 00	16 00	.28
Elk,	95	.65	.65	.48	95	12 00	16 00	.28
Erie,	75	.55	.56	.45	87	10 00	12 00	.29
Fayette,	70	.45	.65	.40	60	15 00	17 00	.27
Forest,	80	.50	.75	.40	1 00	8 00	12 00	.25
Franklin,	87	.42	.50	.35	70	8 50	12 00	.22
Fulton,	65	.45	.55	.35	58	8 00	10 00	.20
Greene,	67	.60	.60	.38	65	12 00	15 00	.24
Huntingdon,	70	.56	.60	.36	1 00	10 00	13 00	.18
Indiana,	70	.60	.60	.40	95	12 00	15 00	.25
Jefferson,	80	.65	.70	.45	1 00	12 00	15 00	.25
Junata,	70	.56	.60	.38	80	10 00	12 00	.25
Lackawanna,	80	.56	.60	.40	1 00	12 00	16 00	.28
Lancaster,	90	.50	.59	.42	85	16 00	18 00	.32
Lawrence,	75	.56	.60	.40	90	11 00	14 00	.28
Lebanon,	75	.46	.60	.38	85	14 00	16 00	.30
Lehigh,	75	.50	.60	.37	80	10 00	12 00	.25
Luzerne,	75	.56	.56	.46	75	14 00	17 00	.25
Lycoming,	75	.60	.60	.40	1 00	12 00	14 00	.25
McKean,	80	.58	.65	.40	90	12 00	14 00	.26
Mercer,	75	.55	.50	.40	60	8 00	10 00	.25
Mifflin,	70	.50	.60	.40	1 00	12 00	14 00	.25
Monroe,	85	.55	.62	.35	90	14 00	16 00	.25
Montgomery,	75	.56	.60	.40	80	15 00	18 00	.32
Montour,	75	.50	.56	.40	80	10 00	12 00	.25
Northampton,	75	.50	.60	.35	80	12 00	14 00	.26
Northumberland,	75	.50	.55	.38	85	10 00	15 00	.26
Perry,	68	.50	.60	.32	75	10 00	12 00	.22
Philadelphia,	75	.52	.60	.40	90	12 00	18 00	.30
Pike,	80	.56	.56	.40	1 00	12 00	16 00	.30
Potter,	1 00	.63	.65	.48	60	8 00	10 00	.22
Schuylkill,	82	.60	.68	.48	85	12 50	14 50	.30
Snyder,	72	.45	.50	.35	75	10 00	12 00	.26
Somerset,	70	.55	.55	.40	60	10 00	12 00	.20
Sullivan,	95	.70	.70	.45	95	12 00	16 00	.24
Susquehanna,	88	.68	.70	.45	85	10 00	14 00	.28
Tioga,	90	.65	.70	.46	75	10 00	12 00	.28
Union,	75	.48	.55	.34	75	10 00	12 00	.27
Venango,	75	.60	.65	.45	90	8 00	10 00	.26
Warren,	80	.58	.68	.43	90	10 00	12 00	.26
Washington,	72	.55	.62	.38	75	9 00	11 00	.26
Wayne,	75	.55	.60	.40	1 00	9 00	10 00	.25
Westmoreland,	75	.60	.60	.42	80	10 50	14 50	.28
Wyoming,	80	.58	.56	.40	65	10 00	14 00	.25
York,	70	.45	.50	.38	80	12 00	15 00	.30

PRICES OF FARM PRODUCTS, OCTOBER 15, 1893.

COUNTIES.	Wheat, per bushel.	Corn, old.	Corn, new.	Rye.	Oats.	Potatoes.	Clover Hay, per ton.	Timothy Hay.	Mixed Hay.	Butter, at store.	Butter, in market.	Chickens, dressed.	Chickens, alive.	Pork, per 100 lbs.	Eggs, at store.	Eggs, in market.
Adams, . . .	.60	.55	.44	.50	.30		\$11 00	\$13 00	\$9 00	.18	.22	.12	.07	\$6 75	.21	.24
Allegheny, . .	.65	.55	.48	.55	.34	.65	12 00	15 00	11 00	.28	.30	.14	.10	8 60	.24	.26
Armstrong, . .	.60	.60	.50	.55	.35	.50	10 00	12 00	11 00	.22	.25	.10	.07	8 00	.18	.20
Beaver, . . .	.60	.60	.50	.60	.35	.50	10 00	13 00	12 00	.30	.35	.12	.10	8 00	.20	.22
Bedford, . . .	.73	.65	.60	.70	.40	.90	10 00	18 00	16 00	.25	.27	.12	.08	6 00	.15	.17
Berks, . . .	.72	.50	.45	.56	.38	.75	14 50	17 50	15 00	.24	.27	.12	.10	8 00	.20	.22
Blair, . . .	.65	.48	.45	.58	.50	.90	14 00	16 00	15 00	.35	.38	.12	.10	8 00	.22	.25
Bradford, . . .	.75	.60	.55	.54	.40	.50	8 00	14 00	12 00	.22	.24	.10	.07	7 00	.16	.18
Bucks, . . .	.73	.55	.50	.50	.40	.75	18 00	20 00	18 00	.30	.35	.15	.13	8 00	.20	.24
Butler, . . .	.70	.53	.48	.50	.40	.60	10 00	15 00	12 00	.28	.30	.12	.08	7 50	.20	.22
Cambria, . . .	.67	.50	.48	.54	.36	.65	11 50	16 00	13 50	.25	.24	.13	.08	8 00	.20	.22
Cameron, . . .	.80	.60	.50	.58	.40	.60	12 00	14 00	12 00	.22	.27	.15	.12	8 00	.20	.22
Carbon, . . .	.65	.50	.45	.60	.40	.60	15 00	18 00	16 00	.23	.25	.15	.12	8 50	.23	.25
Centre, . . .	.60	.50	.40	.55	.30	.60	12 00	15 00	14 00	.20	.22	.10	.08	6 00	.18	.20
Chester, . . .	.65	.54	.50	.56	.35	.70	16 00	20 00	18 00	.30	.35	.16	.12	8 00	.20	.22
Clarion, . . .	.68	.60	.50	.65	.40	.50	10 00	12 00	11 00	.22	.24	.12	.10	7 75	.18	.20
Clearfield, . .	.75	.60	.50	.60	.40	.75	17 00	18 00	18 00	.25	.30	.13	.10	8 00	.20	.25
Clinton, . . .	.65	.55	.50	.60	.35	.70	15 00	18 00	16 00	.25	.28	.12	.08	7 00	.14	.18
Columbia, . . .	.65	.55	.50	.56	.32	.60	12 00	14 00	13 00	.24	.26	.11	.07	7 00	.20	.22
Crawford, . . .	.80	.54	.50	.52	.36	.50	9 00	10 00	9 00	.20	.22	.11	.07	7 50	.18	.20
Cumberland, . .	.65	.50	.48	.48	.30	.70	12 00	15 00	14 00	.18	.20	.12	.08	8 00	.18	.20
Dauphin, . . .	.65	.60	.54	.55	.38	.80	14 00	20 00	16 00	.20	.22	.12	.08	7 75	.23	.25
Delaware, . . .	.65	.55	.45	.60	.45	.75	20 00	23 00	21 00	.35	.37	.15	.10	8 50	.20	.25
Elk, . . .	.70	.60	.55	.65	.45	.60	15 00	17 00	16 00	.28	.30	.14	.10	8 00	.20	.22
Erie, . . .	.73	.56	.50	.60	.40	.60	12 00	15 00	10 00	.25	.27	.16	.12	6 50	.15	.18
Fayette, . . .	.65	.60	.60	.60	.40	.85	15 00	18 00	16 00	.32	.28	.15	.10	6 50	.25	.20
Forest, . . .	.68	.55	.50	.55	.38	.45	9 00	12 00	10 00	.18	.20	.18	.10	9 00	.16	.18
Franklin, . . .	.62	.48	.45	.45	.32	.90	9 00	12 00	10 00	.20	.22	.13	.09	8 00	.18	.20
Fulton, . . .	.62	.50	.45	.50	.35	.75	9 00	12 00	9 00	.18	.20	.12	.06	5 00	.16	.18
Greene, . . .	.60	.65	.60	.75	.35	.75	15 00	15 00	14 00	.25	.30	.08	.06	9 00	.15	.17
Huntingdon, . .	.60	.60	.60	.60	.35	.75	10 00	12 00	10 00	.23	.28	.12	.06	7 00	.18	.20
Indiana, . . .	.65	.58	.50	.60	.32	.45	10 00	12 00	11 00	.22	.25	.10	.06	7 00	.16	.16
Jefferson, . . .	.70	.68	.55	.60	.40	.55	14 00	15 00	14 00	.25	.28	.06	.10	8 00	.16	.18
Junata, . . .	.60	.63	.60	.50	.40	.80	15 00	16 00	15 00	.20	.22	.10	.08	8 00	.20	.22
Lackawanna, . .	.75	.60	.60	.60	.42	.60	14 00	16 00	14 00	.25	.28	.16	.12	8 00	.20	.25
Lancaster, . . .	.62	.50	.50	.56	.38	.80	14 00	16 00	15 00	.18	.22	.11	.09	6 90	.20	.22
Lawrence, . . .	.65	.55	.50	.55	.35	.50	10 00	12 00	11 00	.25	.30	.10	.06	7 00	.15	.18
Lebanon, . . .	.65	.55	.50	.55	.35	.70	14 00	15 00	14 00	.16	.22	.10	.08	8 50	.18	.20
Lenigh, . . .	.73	.54	.50	.60	.36	.58	16 00	22 00	19 00	.26	.28	.15	.11	12 00	.20	.22
Luzerne, . . .	.75	.62	.60	.68	.45	.67	14 00	20 00	17 00	.25	.28	.18	.14	8 00	.22	.24
Lycoming, . . .	.70	.62	.50	.56	.32	.70	12 00	16 00	14 00	.22	.26	.15	.08	8 00	.18	.22
McKean, . . .	.65	.58	.50	.50	.40	.60	13 00	15 00	14 00	.22	.20	.15	.10	10 00	.15	.18
Mercer, . . .	.65	.60	.45	.56	.33	.50	9 00	10 00	10 00	.25	.27	.13	.10	6 00	.18	.20
Mifflin, . . .	.63	.60	.45	.50	.32	.90	12 00	14 00	13 00	.25	.28	.11	.09	8 00	.17	.18
Monroe, . . .	.70	.55	.40	.60	.38	.60	14 00	18 00	16 00	.28	.30	.14	.10	7 75	.22	.24
Montgomery, . .	.65	.56	.50	.60	.40	.75	15 00	20 00	18 00	.26	.32	.18	.10	8 00	.22	.24
Montour, . . .	.70	.60	.45	.58	.32	.60	13 00	18 00	15 00	.24	.26	.12	.08	8 00	.15	.17
Northampton, .	.70	.60	.50	.55	.38	.65	13 00	16 00	14 00	.25	.30	.12	.08	7 50	.20	.24
Northumberland,	.65	.50	.45	.54	.30	.60	10 00	16 00	14 00	.22	.26	.13	.10	8 00	.20	.22
Perry, . . .	.61	.62	.60	.62	.32	.60	8 00	12 00	10 00	.18	.20	.10	.08	8 00	.18	.20
Philadelphia, . .	.65	.55	.50	.56	.45	.90	16 00	20 00	18 00	.18	.35	.18	.12	7 00	.22	.28
Pike, . . .	.70	.56	.50	.58	.43	.75	13 00	15 00	12 00	.27	.30	.12	.10	8 00	.22	.24
Potter, . . .	.80	.55	.50	.60	.50	.60	10 00	12 00	11 00	.28	.25	.08	.06	8 50	.18	.20
Schuylkill, . . .	.72	.58	.50	.56	.40	.75	16 00	18 00	17 00	.24	.26	.15	.12	8 00	.20	.24
Snyder, . . .	.70	.40	.50	.60	.35	.50	8 00	12 00	10 00	.22	.28	.12	.07	7 00	.18	.21
Somerset, . . .	.70	.58	.50	.60	.35	.60	12 00	16 00	13 00	.30	.32	.12	.08	7 50	.22	.24
Sullivan, . . .	.68	.55	.50	.56	.35	.58	10 00	14 00	12 00	.20	.24	.12	.08	8 00	.24	.25
Susquehanna, . .	.90	.60	.53	.60	.40	.50	8 00	10 00	11 00	.25	.27	.18	.08	6 00	.30	.32
Tioga, . . .	.90	.56	.50	.65	.40	.50	8 00	10 00	9 00	.18	.22	.10	.07	6 00	.15	.18
Union, . . .	.65	.55	.50	.56	.36	.60	10 00	13 00	12 00	.24	.26	.12	.08	8 00	.20	.24
Venango, . . .	.65	.60	.55	.55	.35	.45	8 00	10 00	9 00	.20	.25	.10	.07	8 00	.15	.17
Warren, . . .	.72	.62	.45	.65	.36	.50	8 00	10 00	9 00	.25	.27	.13	.10	7 00	.18	.20
Washington, . .	.62	.48	.43	.50	.35	.70	10 00	12 00	11 00	.25	.28	.12	.08	5 50	.15	.18
Wayne, . . .	.70	.56	.48	.56	.36	.50	8 00	10 00	10 00	.22	.24	.12	.08	7 00	.21	.21
Westmoreland, .	.68	.60	.50	.68	.38	.70	12 00	16 00	14 00	.25	.30	.12	.08	6 50	.30	.32
Wyoming, . . .	.75	.60	.50	.60	.34	.45	10 00	13 00	12 00	.24	.28	.14	.12	8 50	.30	.31
York, . . .	.65	.62	.48	.45	.32	.70	13 00	18 00	15 00	.20	.25	.15	.11	8 00	.18	.20

VALUES OF LIVE STOCK—MAY, 1893.

COUNTIES.	Ewes, (average) per head.	Lambs, per head.	Horses (average) per head.	Mules (average) per head.	Cows (average) per head.	Chickens, (dressed) per pound.
Adams.	\$3 75	\$3 00	\$75 00	\$90 00	\$26 00	.10
Allegheny.	3 50	2 25	85 00	90 00	35 00	.18
Armstrong.	2 25	2 25	80 00	70 00	28 00	.12
Beaver.	2 50	2 25	100 00	105 00	25 00	.10
Bedford.	3 50	2 50	80 00	100 00	25 00	.10
Berks.	3 00	2 50	65 00	55 00	25 00	.12
Blair.	4 00	3 00	80 00	95 00	27 00	.12
Bradford.	4 50	3 25	90 00	80 00	29 00	.10
Bucks.	4 00	3 50	125 00	115 00	37 00	.14
Butler.	3 00	2 50	90 00	80 00	30 00	.12
Cambria.	3 00	2 00	100 00	90 00	30 00	.12
Cameron.	3 50	2 50	125 00	110 00	29 00	.14
Carbon.	3 75	2 75	100 00	105 00	27 00	.13
Centre.	5 00	3 00	90 00	80 00	24 00	.10
Chester.	4 50	5 00	125 00	100 00	40 00	.14
Clarion.	4 00	4 50	80 00	70 00	25 00	.10
Clearfield.	3 00	1 50	100 00	110 00	25 00	.16
Clinton.	4 50	3 00	110 00	90 00	30 00	.12
Columbia.	5 00	5 00	90 00	75 00	25 00	.12
Crawford.	3 50	3 00	110 00	90 00	30 00	.12
Cumberland.	3 75	3 00	80 00	75 00	27 00	.12
Dauphin.	4 00	4 00	105 00	115 00	35 00	.15
Delaware.	3 50	2 50	100 00	80 00	38 00	.12
Elk.	3 00	1 75	80 00	75 00	28 00	.12
Erie.	4 00	3 00	75 00	60 00	28 00	.12
Fayette.	3 50	3 00	90 00	110 00	27 50	.12
Forest.	3 25	2 75	100 00	100 00	30 00	.12
Franklin.	6 00	3 00	120 00	125 00	32 00	.13
Fulton.	3 50	3 00	85 00	110 00	25 00	.10
Greene.	3 00	2 00	87 50	75 00	25 00	.10
Huntingdon.	4 00	3 00	95 00	85 00	24 00	.10
Indiana.	2 00	2 50	95 00	95 00	28 00	.12
Jefferson.	5 00	2 00	80 00	80 00	22 00	.12
Junata.	4 00	2 00	90 00	100 00	25 00	.10
Lackawanna.	5 00	3 00	90 00	70 00	30 00	.14
Lancaster.	5 00	3 00	120 00	125 00	40 00	.10
Lawrence.	4 00	3 00	75 00	75 00	25 00	.10
Lebanon.	4 00	3 00	80 00	100 00	32 50	.12
Lehigh.	4 00	3 00	100 00	110 00	30 00	.12
Luzerne.	4 00	3 00	125 00	125 00	28 00	.16
Lycoming.	5 00	3 00	100 00	90 00	30 00	.10
McKean.	4 50	3 00	90 00	95 00	30 00	.12
Mercer.	3 00	2 50	100 00	90 00	40 00	.15
Mifflin.	4 00	4 50	100 00	90 00	27 00	.12
Monroe.	4 50	3 50	100 00	100 00	25 00	.12
Montgomery.	4 50	4 00	75 00	100 00	30 00	.13
Montour.	4 00	3 75	100 00	110 00	30 00	.14
Northampton.	4 50	3 50	80 00	100 00	33 00	.15
Northumberland.	4 50	3 25	90 00	100 00	35 00	.16
Perry.	3 00	2 00	60 00	75 00	22 00	.10
Philadelphia.	5 00	4 50	115 00	100 00	35 00	.14
Pike.	5 00	4 00	125 00	100 00	25 00	.16
Potter.	5 00	3 00	100 00	80 00	30 00	.10
Schuylkill.	4 50	3 50	110 00	75 00	32 00	.16
Snyder.	4 50	3 00	700 00	80 00	25 00	.14
Somerset.	4 50	3 50	100 00	100 00	24 00	.13
Sullivan.	4 25	3 00	85 00	80 00	28 00	.12
Susquehanna.	4 50	3 25	95 00	85 00	29 00	.12
Tioga.	4 75	3 25	85 00	85 00	30 00	.10
Union.	4 75	3 25	95 00	100 00	30 00	.10
Venango.	3 00	2 75	100 00	90 00	25 00	.12
Warren.	5 00	3 75	85 00	70 00	38 50	.15
Washington.	3 50	3 00	85 00	70 00	32 00	.12
Wayne.	3 50	3 50	75 00	75 00	30 00	.12
Westmoreland.	4 00	3 00	120 00	125 00	28 50	.10
Wyoming.	3 75	3 00	100 00	75 00	26 50	.12
York.	2 50	2 00	100 00	90 00	30 00	.14

FARM WAGES AND BOARD—OCTOBER, 1893.

COUNTIES.	By the month (whole year), with board.	By the month (summer months only), with board.	By the day (transient work), with board.	By the day, with regular work (with board).	By the day, with regular work (without board).	By the month (whole year), without board.	By month, for summer months (without board).	By day, for transient work (without board).	Harvest wages (without board).	Household help, female, (with board), by week.	Estimated cost of boarding farm hands, per day.
Adams	\$13 00	\$15 00	\$0 75	\$0 75	\$1 00	\$20 00	\$23 00	\$1 10	\$1 00	\$1 75	.35
Allegheny	16 00	18 00	1 00	1 00	1 40	24 00	26 00	1 40	1 75	2 50	.50
Armstrong	12 00	15 00	.75	.75	1 00	20 00	24 00	1 00	1 00	1 75	.30
Beaver	12 00	15 00	1 20	1 00	1 25	25 00	30 00	1 50	1 50	2 00	.40
Bedford	10 00	14 00	1 00	.75	1 10	22 00	24 00	1 25	1 50	1 75	.30
Berks	12 50	20 00	1 00	1 00	1 30	30 00	37 50	1 50	1 70	2 00	.37
Blair	12 50	20 00	1 25	.80	1 25	30 00	35 00	1 50	1 50	2 00	.50
Bradford	15 00	18 00	1 10	.80	1 20	23 00	28 00	1 37	1 50	2 25	.37
Bucks	13 00	18 00	1 00	.75	1 00	20 00	24 00	1 25	1 50	3 00	.25
Butler	13 50	16 50	1 00	1 00	1 50	26 00	30 00	1 50	1 50	3 75	.40
Cambridge	16 50	22 00	.75	1 00	1 50	26 00	30 00	1 00	1 25	2 50	.40
Cameron	12 00	16 00	1 00	.80	1 00	20 00	26 00	1 25	1 25	2 50	.35
Carbon	16 00	18 50	1 00	.90	1 00	20 00	25 00	1 10	1 25	2 25	.30
Centre	16 50	18 00	1 00	.90	1 00	20 00	24 00	1 10	1 20	2 00	.30
Chester	16 00	18 00	.90	.75	1 25	28 00	30 00	1 25	1 50	2 00	.40
Clarion	12 00	14 00	.75	.80	1 00	18 00	20 00	1 00	1 25	2 50	.30
Clearfield	15 00	18 00	1 00	1 05	1 25	18 00	22 00	1 50	1 25	2 00	.50
Clinton	14 00	16 00	.85	.75	1 00	20 00	24 00	1 20	1 25	1 75	.30
Columbia	15 00	17 00	1 00	.85	1 10	22 00	24 00	1 20	1 25	1 75	.30
Crawford	15 00	20 00	1 00	.90	1 25	22 00	28 00	1 25	1 37	2 00	.35
Cumberland	11 00	13 00	.75	.75	1 00	17 00	22 00	1 00	1 25	2 00	.25
Dauphin	14 00	16 00	1 25	1 00	1 25	25 00	30 00	1 50	1 00	2 00	.50
Delaware	18 00	20 00	1 25	1 10	1 25	30 00	35 00	1 60	1 50	3 00	.30
Elk	20 00	25 00	1 25	1 10	1 25	30 00	32 00	1 60	1 50	3 00	.50
Essex	14 50	18 00	1 25	1 00	1 10	22 00	26 00	1 50	1 60	2 00	.50
Fayette	16 00	20 00	1 00	1 10	1 35	24 00	28 00	1 35	1 50	2 00	.40
Forest	15 00	18 00	1 00	1 00	1 50	25 00	30 00	1 50	1 50	2 50	.50
Franklin	11 00	13 00	.75	.60	.80	18 00	24 00	1 00	1 25	1 75	.30
Fulton	12 50	15 00	.50	.50	.75	18 00	20 00	.75	1 25	1 25	.25
Greene	12 00	16 00	.75	.75	1 00	20 00	25 00	1 00	1 50	1 75	.38
Huntingdon	12 50	15 00	.90	.85	1 00	20 00	25 00	1 00	1 50	1 25	.35
Indiana	12 50	16 50	1 00	.75	1 20	20 00	25 00	1 00	1 25	2 50	.40
Jefferson	13 00	16 00	1 00	.80	1 25	25 00	30 00	1 00	1 50	2 00	.36
Juniata	12 00	14 00	.75	.75	1 00	22 00	25 00	1 00	1 25	1 50	.25
Lackawanna	16 00	20 00	1 00	1 00	1 25	28 00	32 00	1 25	1 65	2 00	.40
Lancaster	14 00	17 00	1 00	.90	.90	25 00	28 00	1 25	1 50	2 00	.25
Lawrence	15 00	20 00	1 00	1 00	2 25	25 00	30 00	1 25	1 50	2 50	.25
Lebanon	13 00	18 00	.90	1 00	1 25	24 00	28 00	1 25	1 50	2 00	.30
Lehigh	13 00	16 00	1 00	1 10	1 20	28 00	31 00	1 25	1 50	2 00	.30
Luzerne	20 00	21 00	1 50	1 25	1 50	30 00	35 00	1 50	2 00	2 00	.40
Lycoming	15 00	20 00	1 00	1 00	1 50	24 00	28 00	1 30	1 50	2 50	.45
McKean	18 50	22 00	1 00	.90	1 30	25 00	30 00	1 10	1 50	2 00	.30
Mercer	15 00	20 00	1 00	.80	1 50	20 00	25 00	1 50	2 00	3 00	.40
Mifflin	12 00	15 00	1 00	.75	1 15	27 00	30 00	1 20	1 25	1 50	.40
Monroe	13 00	15 00	.75	.65	1 00	23 00	28 00	1 25	1 50	2 00	.35
Montgomery	15 00	20 00	1 00	1 00	1 50	30 00	35 00	1 50	2 00	2 50	.50
Montour	12 00	15 00	.75	.75	1 10	25 00	35 00	1 00	1 25	2 00	.40
Northampton	12 00	15 00	.75	.85	1 00	24 00	30 00	1 20	1 50	2 00	.35
Northumberland	12 50	15 00	.75	.70	1 00	23 00	28 00	1 12	1 40	1 50	.40
Perry	10 00	12 00	.75	.60	1 00	16 00	20 00	1 00	1 00	1 50	.30
Philadelphia	15 00	23 00	1 50	1 25	1 50	27 50	37 50	2 00	2 50	3 00	.50
Pike	17 00	20 00	1 00	.75	1 00	25 00	30 00	1 25	1 50	2 00	.45
Potter	12 00	20 00	1 00	1 00	1 37	25 00	30 00	1 25	1 50	2 50	.36
Schuylkill	12 50	17 50	1 10	.85	1 25	22 00	26 00	1 25	1 50	3 00	.35
Snyder	10 00	15 00	.75	.65	1 00	20 00	24 00	1 00	1 25	2 00	.30
Somerset	15 00	20 00	.75	.75	1 00	20 00	30 00	1 00	1 25	1 75	.30
Sullivan	17 00	22 50	1 15	1 00	1 25	25 00	33 00	1 50	1 50	2 25	.45
Susquehanna	14 00	18 00	1 00	.90	1 25	20 00	26 00	1 25	1 75	2 00	.35
Tioga	16 00	20 00	1 00	1 00	1 25	25 00	30 00	1 00	1 50	2 00	.30
Union	12 00	15 00	1 00	1 00	1 25	20 00	25 00	1 00	1 25	1 50	.40
Venango	18 00	20 00	1 25	1 50	1 50	25 00	30 00	1 50	1 25	3 00	.25
Warren	18 00	24 00	1 25	1 00	1 50	22 50	27 50	1 50	1 50	2 75	.40
Washington	14 00	16 00	1 00	.75	.85	25 00	30 00	1 50	1 50	2 50	.40
Wayne	20 00	25 00	1 25	1 00	1 50	25 00	30 00	1 25	1 50	2 25	.40
Westmoreland	20 00	26 00	1 12	1 00	1 37	27 00	35 00	1 30	1 50	2 50	.45
Wyoming	14 00	18 00	1 00	1 00	1 10	25 00	30 00	1 00	1 50	2 00	.38
York	13 00	18 00	.85	.75	1 12	20 00	25 00	1 12	1 40	1 50	.30

INDEX BY AUTHORS.

	PAGE.
AGRICULTURAL COUNCIL OF SAXONY, Agricultural Experiments,	126
ARMSBY, DR. H. P., Agricultural Experiment Stations,	124
Rations for dairy cows,	256
BAHM, M. W., Farmers' boys,	355
BARBER, S. F., Remarks on fencing,	310
BARNES, DR. J. P., Agricultural Society bounties,	186
BECKWITH, PROF., Web-worm,	96
BEAM, DR., Composition of milk,	111
BREIDENBAUGH, PROF. E. S., Nitrogen,	333
BRIDGE, DR. F., Colic in horses,	102
BUCKHOUT, PROF. W. A., Ravages of clover leaf beetle,	94
BUTZ, PROF. GEORGE C., Peach yellows,	132
CHESTER, PROF., Report on peach rot,	40
Spraying grape vines,	92
COCHRAN, PROF. C. B., Milk, skim milk and whey,	113
Temperature and specific gravity of milk,	295
COLLIER, DR. PETER, Experiments with cheese,	83
Action of nitrogen,	328
Nitrogen and ammonia,	338
COOKE, PROF., Value of corn fodder,	93
COMSTOCK, PROF., The bud moth,	97
COOPER, CALVIN, Manufacture and application of domestic fertilizers,	165
Character of evening exercises at institutes,	190
CORNELL UNIVERSITY EXPERIMENT STATION, Production of Manure,	62
Wire worms,	98
CRITCHFIELD, HON. N. B., The care of farm horses,	156
Remarks on fencing,	306
CUTSHALL, H. M., How to improve country roads,	341
DAVIS, CHARLES H., Cost of electric railways,	263
DEGRAW, GEO. O., Starting an orchard,	339
DELAWARE EXPERIMENT STATION, Spraying grape vines,	91
DONMOYER, M. T., Grape growing,	357
DOWNING, HON. S. R., Report of committee on roads and road laws,	148
DROOP, H., Analyses of milk,	110
DUPRE, DR., Specific gravity of milk,	113

EDGE, THOMAS J. (Secretary). Synopsis of meetings of the Board, 9; Extracts from the annual report of the secretary, 19; Crop reports, 19; Local or farmers' institutes, 26; Texan fever, 28; Glanders, 31; Tuberculosis, 34; Line or division fences, 36; Peach rot, 40; Potato blight, 42; Imitation dairy products, 43; Feeding value of the corn crop, 50; Feeding corn stalks and straw, 56; Commercial fertilizers, 57; Production of manure, 62; Feeding for pork, 67; Cream separator and butter extractor, 71; Yield and cost of milk, 73; Salting butter, 79; Edam and Gouda cheese, 84; Spraying grapes, 90; Insect enemies, 92; Wire worms, 92; Clover leaf beetle, 94; Clover root borer, 96; The bud moth, 97; Diseases of dairy cows, 173; Milk fever, parturient apoplexy, parturition fever, 174; Garget or caked bag, 178; Catarrh, 179; Pneumonia, 180; Splenic apoplexy, 182; Tympanitis-Hoven, 183; Hoof-all or foul claw, 184; Forestry notes, 206; Potato culture, 225; Rations for dairy cows, 246; Notes on nitrogen, 325.

	PAGE.
EDGE, DR. JOHN P., Responsibility of the farmer class in legislation,	191
ENGLE, E. B., Insecticides,	286
ENGLE, H. M., Remarks on fencing	308
ESH, N. H., Care of farm animals,	349
EVES, CHANDLEE, Remarks on fencing,	311
FERNALD, PROF., The bud moth,	98
FLEMING, DR., Splenic apoplexy,	182
FLETCHER, DR., Insecticides,	99
FLOWER, GOVERNOR, Manufacture of cheese,	88
GARRAHAN, M., The ideal potato crop,	345
GATES, LUTHER, Hay and haying,	20
Constructing and repairing roads,	341
Remarks on fencing,	307
GALLOWAY, PROF. B. T., Potato blight,	48
GOOD, DR. C. R., Progress of veterinary science,	360
GREIR, A. R., Public roads,	291
GROFF, DR. G. G., Practical disinfection,	104
Instincts of the honey bee,	118
HARRIS, PROF. JOSEPH, Nitrate of soda,	327
HARTRANFT, GOV. J. F., Message on forestry,	206
HATCH EXPERIMENT STATION, The bud moth,	98
HEIGES, PROF. S. B., Agriculture in the public schools,	289
Another year's experience with fruit,	282
HEMPHILL, HON. JOSEPH, Decision on line fences,	87
HENRY, PROF. W. A., Feeding for pork,	71
HERR, JOEL A., Practical road making,	169
Distribution of institute fund,	189
Agricultural education,	217
HERRINGTON, MAJ. B. F., Science of agriculture in public schools,	198
HIESTER, GABRIEL, Spraying grape vines and pear trees,	90
HIGHLAND AGRICULTURAL SOCIETY, Nitrogenous manure,	329
HILL, DR. WOODROFFE, Treatment of milk fever,	176
Treatment of pneumonia,	180
Splenic apoplexy,	188
Hoof-all or foul claw,	184
HOARD, HON. WILLIAM D., Breeding, feeding and handling of dairy cattle,	267
Need of more general dairy education,	315
HOPWOOD, GEORGE, Report on fruit and fruit culture,	145
Beautify the farm,	344
HUSTON, PROF. H. A., Experiments with nitrogen,	327
JENKINS, DR., Nitrate of soda,	332
JENNINGS, JASPER T., Grumbling,	339
JOHNSON, W. B. K., Remarks on fencing,	305
KIRK, EDWARD R., How to build a pigeon loft,	351
KISTLER, D., Remarks on fencing,	309
LAW, DR. JAMES, Symptoms of glanders,	32
Symptoms of milk-fever,	176
Treatment of milk-fever,	177
Treatment of garget or caked bag,	177
Hoof-all or foul claw,	185
LAWES, JOHN BENNETT, Field experiments	125

	PAGE.
LAWSON, D. W., Oleomargarine legislation,	50
Remarks on fencing,	206
LEFFMAN, DR. HENRY, Report of microscopist and food inspector,	107
LEIBIG, JUSTUS, Origin of experiment stations,	124
LINDSEY, J. B., Feeding for pork,	67
LORD, B. B., Holstein cattle for general purposes,	348
MASSACHUSETTS BOARD OF AGRICULTURE, The bud moth,	97
MASSACHUSETTS EXPERIMENT STATION, Feeding for pork,	67
MCCRACKEN, JAMES, JR., Sheep raising for profit,	286
MCSARRAN, J. G., Maintaining fertility by commercial fertilizers,	254
MCWILLIAMS, D. B., Teaching agricultural chemistry,	237
MEEHAN, PROF. THOMAS, Report of botanist,	100
A talk about seeds,	311
MITCHELL, B. C., Pure and wholesome milk,	354
MONOGHAN, R. E., Remarks on fencing,	305
MOSSFORD, J. C., Potato growing that pays,	267
MURRAY, JOHN, Distribution of rainfall,	116
NATIONAL DEPARTMENT OF AGRICULTURE, Texan fever,	30
Corn crop,	22
Oats crop,	23
Canned goods,	113
NEW JERSEY EXPERIMENT STATION, Feeding corn stalks and straw,	55
OLIVER, M. W., What is practical dairying?	287
PACKARD, DR. A. S., The bud moth,	97
PARRY, MRS. DR. W. H., Country life,	256
PASCHALL, S. EDWARD, Farmers' Clubs and Experiment Stations,	352
PATTERSON, D. H., Report of committee on cereals,	142
PATTERSON, JOHN, Special fertilizer,	9
PATTISON, GOV. R. E., Remarks on oleomargarine,	48
Pennsylvania agriculture,	152
Taxation,	202
Roads and road laws,	226
PAXSON, CARRIE B., Nature's lessons,	255
PETERS, JUDGE RICHARD, Origin of peach-yellows,	132
PIPER, DR., Effects of deforestation,	209
POWELL, GEO. T., Fruit growing a specialty,	276
Essentials for successful dairying,	320
PRINCE, WILLIAM, Remedy for peach-yellows,	126
REYNOLDS, MISS MAME L., Beauty in rural homes,	246
RICE, EMMA L. KENDERDINE, Why am I a granger?	339
RIDGWAY, MAJOR FRANK, Distribution of rain and snow,	116
Report as meteorologist,	369
RIDDLE, W. H. H., The county fair,	225
RILEY, DR. C. V., The clover root borer,	95
ROLAND, DR. W. S., Report on forests and forestry,	128
ROTHROCK, PROF. J. T., Aspects of the forestry problem in Pennsylvania,	120
Forestry in Pennsylvania,	140
SCHOCK, OLIVER D., Unequal assessment of taxes,	297
Does poultry raising pay?	243
SEARLE, R. S., Oleomargarine legislation,	49
Small fruit culture,	381
SEANOR, HON. N., Remarks on fencing,	306
SEXTON, JASON, Report on ensilage and fodder crops,	147
The raising of early lambs for market,	312
SHANNON, J. B., Farming for profit,	273
SHOOK, D. Z., Assisting the dairy commissioner,	50
SIBLEY, J. C., Remarks on fencing,	300
SLINGERLAND, PROF., The bud moth,	96
SMITH, DR. ERWIN T., Report on peach-yellows,	131

	PAGE.
STITZEL, HON. GEO. D., Necessity of change in farming.	198
Spraying fruit trees.	286
STORER, PROF. F. H., Nitrogen from the soil.	325
Fish scrap.	331
Bone meal.	331
Nitrification.	335
STRANAHAN, MRS. C. A., Care of milk.	347
STRANAHAN, HON. J. A., The fence laws of Pennsylvania.	301
SWEETSER, W. S., Experiments in salting butter.	30
TERRY, T. B., Potato growing.	231
THOMAS, J. J., The oleomargarine question.	50
TREAT, MRS., Clover root borer.	96
VIETH, DR., Analyses of milk.	115
VIGER, MONSIEUR, Food equivalents for hay.	55
VERMONT EXPERIMENT STATION, Potato blight.	41
Feeding value of corn crop.	50
VOORHEES, PROF., Protein in cattle food.	56
WANKLYN, PROF., Method of milk analyses.	109
WALLEY, PROF., Constipation in milk fever.	176
WARREN, DR. B. H., Report of committee on birds and mammals.	142
WASSON, C. J., Intensive farming.	347
WATERS, PROF. H. J., Report on salting butter.	80
WATSON, PROF., Production of manure.	62
WELD, R. J., Experiments in salting butter.	80
WHITSON, MRS. ELIZA R., Requisites of a country home.	243
WILLIAMS, DR. W., Report on glanders.	32
WILLIAMS, HON. H. W., Decision relative to oleomargarine.	46
WILLIAMS, DR. W., Catarrhal affections.	180
WING, PROF. H. H., Yield and cost of milk.	73
WISCONSIN EXPERIMENT STATION, Rations for dairy cows.	247
WOLL, DR., Rations for dairy cows.	250
WOODWARD, J. S., Rations for pork.	71

INDEX BY SUBJECTS.

	Page.		Page.
Absorbents in stables,	166	Apples, crop and prices,	145-146
Absorbing moisture,	315	Apple culture and scab,	279-281
Acid, carbolic,	107	Apple tree blight and remedy,	278-283
Act, the Hatch,	130	Apliarist, report of,	118
Act, peach-yellows,	132	Aphis, peach tree,	136
Act, forestry commission,	139	Aphis, varieties of,	287
Acts, road,	302	Applying home-made manure,	166-167
Action on fence disputes,	304	Apoplexy, splenic,	181
Advisory committee,	12	Apoplexy, parturient,	174
Adams county corn crop,	21	Application of fertilizers,	165
Adulteration in milk,	110	Arctic plants on mountains,	313
Advocating better roads,	170	Aspects of forestry,	130
Advantage of good roads,	294	Assessed value of farms,	153
Agricultural stations,	123	Assessment, unequal of taxes,	297
Agricultural stations in Europe,	126	Assorting potatoes,	228
Agricultural stations in United States,	126	Astronomy in schools,	241
Agricultural station, statistics,	128	Average crops of wheat,	30
Agricultural station, Pennsylvania,	130	Average crops of corn,	21
Agricultural periodicals,	153	Average crops of potatoes,	24
Agricultural society bounties,	186	Average value of manure,	66
Agricultural societies, how organized,	186	Average butter fat,	74
Agriculture in schools,	196-239-296-218-241	Average composition of milk,	111
Agriculture and forestry,	206	Average rain-fall,	116
Agricultural chemistry,	337	Average rain-fall not changed,	210
Alkaline fertilizers,	60	Average product of cows,	239-317
American forests,	121	Average county tax rate,	290
Amusements at fairs,	224	Average tax on farms,	301
Ammonia in stables,	273		
Analyses of fertilizers,	58		
Annual report,	9-19		
Animal diseases,	28		
Annual product of farms,	153		
Anthraxnose on grapes,	91		
Annual meeting, minutes of,	9		
Analyses of manure,	63		
Antiseptics, use of,	104		
Analyses of milk,	113	Bad smells, to disinfect,	106
Annual rings on trees,	121	Basements in barns,	156
Animals, diseases of,	173	Balky horses,	163
Annual rainfall,	209	Bag, caked,	178
Annual county fairs,	223	Barn for sheep,	239
Analyses of soils,	255	Back-bone in cows,	270
Annual loss in cattle,	316	Bagging grapes,	231
Aplary, committee on,	6	Bad roads in Chester county,	282
Appropriations for institutes,	27-189	Barb wire fences,	309
Applications for institutes,	26	Bees, instinct of,	118
Appropriations for board,	8	Bee cells,	119
Apple trees, injury to,	97	Bee, queen,	119
Apple trees, spraying,	99-278	Bees, swarming,	119

	Page.		Page.
Better economy with manure,	166	Cesspools, to disinfect,	105
Better system of farming,	198	Cheese, Edam and Gouda,	83
Better system of haymaking,	221	Cheese covers,	85
Berries, to evaporate,	277	Cheese, moulds,	87-89
Beautifying farms,	343	Chemical changes in fruit,	101
Beauty in rural homes,	346	Cheese, a wholesome food,	109
Birds and mammals, committee,	6-142	Chemical composition of milk,	112-113
Black rot on grapes,	90-279	Character of institutes,	190
Blackberries, crop of,	146	Cherry crop, failure of,	284
Blackberry culture,	277	Chestnut culture,	202
Bleeding for diseases,	177	Chestnut trees, growing,	202
Black-knot on plum trees,	280	Chemistry in agriculture,	242
Blight on potatoes,	41-42	Chloride of lime, use of,	107
Board, members of,	3-4	Clover leaf beetle,	94
Bone, analyses of,	60-61	Clover root borer,	95
Botanist, report of,	100	Cleared lands, worthless,	120
Bounty to destroy woodchuck,	142	Clay floors in stables,	158
Bounties, how secured by societies,	186-187	Clover soil, value of,	229
Boxes for potatoes,	234	Clubs, farmers',	352
Botany, importance of,	242	Corn, yield in Pennsylvania,	21
Bones, strength of,	269	Corn, yield of United States,	22
Botanist's report on seeds,	343	Corn-fodder, yield of,	52
Bone meal, values,	332	Corn stalks, feeding value,	55
Butter, imitation,	43	Corn, average yield of,	147
Butter extractor,	71-72	Coarse products, value of,	53
Butter-fat, yield of and cost,	74-75	Cows, rations for,	57-262-289
Butter salting,	79-83	Commercial fertilizers for 1893,	57
Bud moth, origin and nature,	97-98	Commercial fertilizers, analysis of,	59-61-256
Bud moth, remedies,	99	Cost of pork,	70
Buckwheat middlings,	56	Cost of milk,	73-79
Bugs, potato, to destroy,	232-234	Cows, manure of,	66
Bugs, squash, to destroy,	286	Cottonseed meal, value of,	66
Butter making on farm,	290	Common cedar, variations in,	101
Brewers' grains, cost of,	56	Colic in horses,	102
Broad tires, use of,	171	Colic, treatment for,	103-104
Breeding lambs,	215	Contagious diseases,	108
Breeding dairy cattle,	267	Composition of milk,	111
		Comparative tests of milk,	112
		Controlling legislation,	198
		Coagulation in milk,	114
		Course in dairying,	131
		Colts, how to feed,	158
		Counter irritants, use of,	176
		Common schools, free,	157
		Cost of wheat,	199
		Cows, average profits of,	275
		Cost of potatoes,	235
		Climatic changes,	207
		Clover, how to raise,	221
		County fairs, managing,	223
		County fairs, gambling at,	224
Carbonate of ammonia,	92	Congress, farmers in,	193
Carbonate of copper,	92	Country homes,	245
Caterpillars on apple trees,	97	Comparative rations,	249
Canker worm,	98	Coming road, the,	260
Caterpillar, pupa of,	98	Codling moth,	278
Caterpillar, to destroy,	99	Copper mixtures,	279
Cane sugar,	100	Costs of division fences,	304
Carbolic acid, use of,	107	Cold storage for trees and seeds,	313
Canned goods,	112	Country life,	356
Cash road tax,	172	Crops of 1893,	19-25
Catarrh in cattle,	179	Creameries, benefits of,	201-291
Caring for hay,	220	Creameries, private,	290
Caring for sheep,	239	Comparative taxes,	299
Carbon in plants,	259	Curculio, spraying for,	146-280
Cattle breeding and feeding,	267	Cutting weeds,	165
Cattle, improved stabling,	271	Cure for hoof-ail,	180
Cattle, to be fenced,	303	Cumberland road,	225
Care of farm horses,	156	Cutting potatoes for seed,	229
Cereals, committee on,	6	Cultivating small fruit,	277

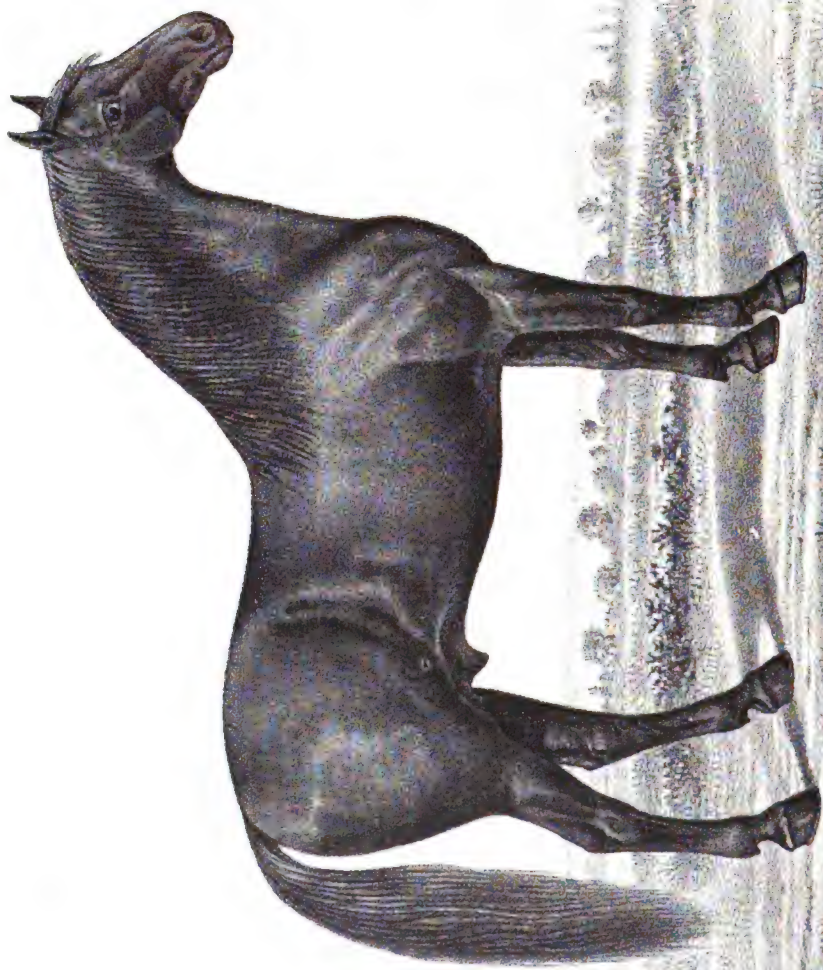
	Page.		Page.
Dairy products, committee on.	6	Education, agricultural,	217
Dairy products, imitation,	48	Education, dairy,	315
Dairy commissioners, duties of,	44	Effect of farmers' institutes,	28
Data relative to forestry,	140	Effect of food on manure,	65
Dairy cows, diseases of,	173	Effect of food on milk,	76
Dairying, profitable,	201-315	Effects of bud moth,	97
Dairy rations for cows,	246-289	Effect of poisonous mushrooms,	102
Dairy cattle, production of,	267-289-315	Effect of high milk standard,	110
Dairy breeds, best,	270	Effect of forestry research,	120
Dairying in the west,	319	Effect of large crops,	154
Dairy, capacity of cows,	320	Effective remedies for cattle,	175
Dairying, winter,	289	Ensilage, committee on,	6
Development of glands,	32	Ensilage, food value of,	52-256
Destroying caterpillars,	98	Ensilage, compared with fodder,	52
Developing nectarines,	100	Ensilage, dry matter in,	53
Defining quality of milk,	113	Entertainments, evening institute,	191
Developing forestry,	121	Entomology in schools,	242
Destroying peach yellows,	132	Enjoying home life,	244
Destroying woodchuck,	142	Erroneous ideas about fences,	302
Depth of corn roots,	169	Essayists on roads,	225
Destinies of the nation,	191	Essentials in dairying,	320
Devising means for revenue,	203	European agricultural stations,	126
Deforestation, effect of,	207	European forestry records,	207
Desirable sheep,	215	Evils, legalized,	196
Demanding better fairs,	223	Evils, of liquor traffic,	196
Deep cultivation for potatoes,	232	Evils of deforestation,	208
Distribution of institutes,	26	Evaporating fruit,	277
Distribution of institute fund,	27	Ewes, profits of,	215
Division fence laws,	36	Ewes, how to care for,	215
Diseases of horses,	102	Extending act of 1885,	108
Disinfection, practical,	104	Experiment station in Pennsylvania,	130
Disinfection, necessity for,	104	Experiment stations in Europe,	126
Disinfectants in the dairy,	106	Experiment stations, work of,	129
Disinfecting sick rooms,	106	Expenditures, increase of,	205
Distribution of rain,	116	Excluding gambling,	223
Diseases mistaken for yellows,	135	Examination of food values,	254
Distributing institute fund,	189	Experience with potatoes,	275
Diversified farming,	199	Excessive grape foliage,	279
Diggers, potato,	233	Examining assessors' methods,	299
Digging potatoes by hand,	233		
Digestible albuminoids,	263		
Domestic fertilizers, to apply,	165		
Domestic fertilizers, to save,	166		
Drains, how to disinfect,	105		
Drainage for homes,	244		
		Farmers' institutes,	26
		Farmers' institutes, funds for,	37
		Farmers' institutes, distribution of,	26
		Farmers' institutes, results of,	28
		Fattening steers, rations for,	57
		Fat in cheese,	90
		Fat in milk,	109
		Fat and solids in milk,	110-111-113
Early blight on potatoes,	42	Facts about rainfall,	117
Early treatment for colic,	104	Factors in forestry,	120
Early training of colts,	162	Farm horses, care and ventilation,	157-159
Early vegetables, supply of,	248	Farms, number and value,	153
Economy in feeding,	272-289-316	Farmers' opportunities,	184
Edible and noxious fungi,	102	Farming, compensation of,	219
Edam cheese,	83	Fair, county, the,	223
Education for the farmer,	191	Fairs, as an educator,	223
Education for children,	193		

	Page.		Page.
Fairs, amusements at,	224	Gain in weight of pigs,	69
Farm manure,	237	Garget, remedy for,	178
Fat in cattle feed,	232	Gambling at fairs,	213
Farming for profit,	274	Gardens, farmers',	245
Farmers as butter makers,	290	General disinfectants,	105
Farmers and better roads,	294	General use of skim milk,	108
Farmers, average taxes on,	298	General timber waste,	124
Farmers, how assessed,	299	German experiment stations,	129
Farm intellect,	318	General products of Penn'a.,	153
Farming, European,	293	General forestry conditions,	207
Farming, intensive,	346	Geology in agriculture,	243
Farm animals, care of,	349	General fence laws,	301
Farmers' boys,	355	Germination of seeds,	314
Fairs, list of,	360	General dairy education,	315
Farmers' institutes held,	364	Gilt edged farmers,	197
Farms, census values,	365	Glanders,	31-34
Farms and products, value of,	366	Glanders, law relating to,	33
Farm products, prices of,	367-368	Glanders, symptoms of,	32
Farm wages, table of,	370	Gluten, value and use of,	255
Fences, line or division,	36-40-303	Good roads,	149-150
Feeding value of corn crops,	50	Gouda cheese,	83
Feeding value of whole ensilage,	52	Good roads, taxation for,	170-226-292
Feeding value of stover and ensilage,	52	Good roads, cost of,	172-225-294
Feeding value of corn-fodder,	52	Good institutes,	189
Feeding value of corn stover,	52	Good seed potatoes,	230
Feeding corn stalks and straw,	55	Gooseberries, hardy,	288
Fertilizers, analyses of,	59-61	Good food for horses,	160
Feeding for pork,	67	Good animal fertilizers,	165
Feeding for milk,	75	Grain, yield of 1893,	19-23
Free ventilation,	105	Ground bone, analyses of,	60
Feeding grain to horses,	160	Grain and manure,	63
Fertilizers, domestic,	165	Ground-hog, to destroy,	145
Fertilizers, liquid,	166	Growing corn-fodder,	147
Fertilizers, vegetable,	165	Growing nut bearing trees,	202
Fertilizers, wasting,	167	Great rainfall in 1889,	209
Fever, milk,	174	Growing lambs for market,	215
Fever, parturition,	174	Growing clover and timothy,	220
Fever, milk, treatment of,	175	Grape mildew,	279
Fever, parturition, treatment of,	175	Gravity, specific, of milk,	295
Feeding lambs,	216	Gravity, specific, average,	295
Feeding dairy cows,	217-267-289	Great want of farmers,	318
Fertility, maintaining,	256	Granger? why am I a,	248
Feeding cows in winter,	289	Grape growing,	356
Fence laws,	301	Grumbling,	339
Fence laws, repeal of,	302		
Fences along railroads,	309		
Finance in schools,	242		
Flavor of fruit,	100		
Flatulent colic,	103		
Flatulent colic, remedy,	103		
Fodder crops, committee on,	6		
Forests and forestry, committee on,	6		
Food and manure,	63		
Food inspectors' report,	107		
Forestry problem in Pennsylvania,	120		
Forest fires, to prevent,	122-138-212		
Forestry, report of committee,	137		
Forestry commission, act,	139		
Foe to forest trees,	140	Harrisburg meeting, minutes of,	9
Fodder crops,	147	Hay crop of 1893,	25
Foul-claw,	184	Handling the corn crop,	51
Forestry notes,	206	Hay consumed by cows,	64
Fruits and fruit culture, committee on,	6	Hay, high prices of,	148
Fruits and flowers,	100	Hay, scarcity of,	220
Fruit and fruit culture,	145	Hay, how to grow,	221
Fruit in Juniata county,	275	Hay, when to harvest,	221
Fruit growing a specialty,	276	Hay, when to cut clover,	222
Fraudulent seeds,	312	Handling potatoes,	233
Fungicides, use of,	283	Harrowing potatoes,	233
Fungi on cherries,	284	Handling dairy cows,	267

	Page.		Page.
Hardy seeds,	312	Larva of wire worm,	92
Health of country homes,	245	Larva of clover beetle,	94
Highways, progressive,	149	Larva of web worm,	96
Highways, benefits of good,	150	Land, assessment of,	290
Highways, legislation for,	151	Legislation, committee on,	6
Highstanding in agriculture,	152	Legislation relating to tuberculosis,	34
Highways, fencing,	303	Leaves of coniferous trees,	101
Honorary officers, list of,	5	Leaves of the cedar,	101
Horse manure, value of,	62	Leeching of manure,	166
House disinfection,	105	Lessons in political economy,	194
Honey bee, instinct of,	119	Legal fencing,	302
Honey bee, how managed,	119	Line fences,	36
Horses, care of,	156	Line fence decisions,	37
Horse stables, how constructed,	158	Limits of pork feeding,	67
Horse feed, proper kinds of,	160	Limit in salting butter,	84
Home-made fertilizers,	166	Light in stables,	159
Hoven, remedy for,	184	Linseed meal, value of,	254
Hoof-all,	184	Life of seeds,	312
Holstein cattle,	348	Life of trees,	313
		Live stock, value of,	359
Improved machinery, effect of,	193	Maintaining line fences,	37
Importance of nut growing,	22	Management of farmers' Institutes,	25
Imitation butter,	45	Manner of distributing Institutes,	26
Improved rations for cattle,	245	Manures, home made,	62
Imitation dairy products,	48	Manurial values,	62
Implements, value of on the farm,	201	Manures, analyses of,	66
Improving the dairy,	317	Management of grape vines,	91
Institutes,	25	Management of peach trees,	133
Institutes, appropriation for,	27	Market value of cereals,	141
Institutes, distribution of,	26	Market value of fruits,	146
Institutes, value of,	28	Management of colts,	157
Injury from peach blight,	41	Manures from vegetable matter,	165
Injury from potato blight,	42	Management of fairs,	223
Injury from black-rot on grapes,	91	Manure for potatoes,	229
Injury from bud moth,	97	Marketing potatoes,	235
Injurious mushrooms,	102	Maintaining fertility,	236
Injudicious feeding,	218	Maximum of production,	256
Insect remedies,	97	Macadamizing roads,	262
Insecticides on apple trees,	99	Marketing hay,	274
Insects injurious to forests,	140	Members ex-officio,	3
Insects injurious to plum trees,	146	Members of Board,	3
Inspection of dairies,	112	Method of handling corn fodder,	52
Instincts of bees,	118	Method of destroying peach yellows,	132
Intelligence of bees,	119	Milk, yield and cost of,	73
Interest in agricultural stations,	125	Milk and butter-fat,	74
Increasing the supply of manure,	166	Milk, average production of,	74
Individuality in farm products,	228	Milk, cost of,	75
Ideal homes,	244	Milk legislation proposed,	108
Insectivorous birds,	277	Milk standards,	110
Influence of good roads,	294	Milk inspection,	110-112
Influence of temperature on milk,	289	Milk, composition of,	111
Intelligence in dairying,	317	Milk, diseases in,	112
		Milk fever, treatment and symptoms,	174-6
		Minutes of meetings of Board,	9

	Page.		Page.
Minimum acreage of wheat.	19	Peach trees, spraying.	41
Microscopist's report.	107	Peach-yellow's law.	132
Motors, use of,	262	Peach-yellow's, nature of.	132
Mushrooms, vitality of,	313	Peach aphid,	136
		Phosphoric acid,	50
		Planting fodder crops,	147
		Planting nut trees.	202
		Plan of rotation,	250
		Potato blight,	41
		Potatoes, profit of,	227
		Potatoes, preparing seed,	229
		Potatoes, manure for,	229
		Potatoes, boxes for,	254
Nature of anthracnose.	91	Poultry, committee on,	6
Nature of potato blight.	42	Poison for insects,	99
National aid for agriculture,	124	Poisonous mushrooms.	101
National economics,	194	Preventing Texan fever,	39
Nature's lessons,	354	Preventing spread of glanders,	32
Necessity of change in farming,	198	Preventing spread of tuberculosis,	34
Necessity for agricultural education,	217	Production of milk,	74
Need of diversified farming,	274	Production of butter-fat,	78
Necessary fences,	303	Proportion of cream in milk,	110
Nitrogen in sheep manure,	66	Propagation of disease by milk,	112
Nitrogen in cow manure,	66	Production of forests,	112
Nitrogen in horse manure,	66	Products of agriculture,	153
Nitrogen, experiments with,	326	Producing fertility,	165
Nitrogen, action of,	328	Practical road making,	170
Nitrogen, use of,	329	Practical dairying,	287
Nitrogen, sources of,	333	Production of manure,	62
Nitrogen and shade,	335	Practical agriculture,	129
Nitrogen and ammonia,	336	Protecting forests,	206
Nitrate of soda,	327	Problem of forestry,	212
Nitrogenous manures,	329	Profits of early lambs,	213
Number of institutes held,	25	Profits of sheep raising,	217
Nutrients in rations,	252	Progress in schools,	241
Nutrients for animals,	254	Profit in farming,	274
		Profit in fruit,	280
		Principles of dairying,	287
		Public schools, agriculture in,	239
		Public roads,	291
		Public roads of England,	293
		Public roads, loans for,	294
Oats, acreage of,	23		
Oats, yield of,	23	Ratio of wheat production,	19
Oats, as food for colts,	157	Rations for pork,	47
Obituary notice,	2	Ratio of food and cost of milk,	73
Oleomargarine legislation,	44	Ravages of bud-moth,	97
Oleomargarine, lawsuits,	46	Rain and snow fall,	115
Oleomargarine, decisions as to sale,	46	Rainfall,	115
Old fence laws,	302	Raising colts,	157
Old seeds, vitality of,	312	Raisings pigs,	201
Origin of experiment stations,	128	Raising nuts,	202
Origin of peach-yellow's,	132	Raising early lambs,	213
Organic matter,	250	Rations for dairy cows,	246
Order at county fairs,	223	Rations, analyses of,	251
Oxen, feed for,	253	Raising fruit for profit,	276
		Remedy for anthracnose,	91
		Remedy for wire worms,	94
		Report of botanist,	100
Parturient apoplexy,	174	Report of microscopist,	107
Parturition fever,	174	Reliable disinfectants,	105
Paying for good roads,	226	Replanting forests,	120
Peach rot,	40	Reclaiming hillsides,	121

	Page.		Page.
Report of Committee on Forestry.	137	Starting clover and timothy.	221
Report of Committee on Fruit.	145	Stacking hay.	222
Report of Committee on Birds.	142	Straw and fodder.	254
Report of Committee on Ensilage.	147	Swarming of bees.	119
Report of Committee on Roads.	148	Symptoms of peach yellows.	134
Restoring fertility.	165		
Relative value of manures.	167		
Responsibility of farmers.	191		
Reducing taxes.	204		
Requisites of a home.	243		
Richmond's milk scale.	115		
Roads, in Europe.	293		
Roads, committee on.	6	Table of corn production.	20
Roads, cost of.	150	Table of wheat production.	20
Roads, loans for.	150	Taxation.	202
Roads, legislation for.	151	Taxation by the State.	204
Roads, cost of improved.	172	Taxation, how regulated.	204
Roads, crushed stone for.	171	Talk about seeds.	311
Roads, constructing and repairing.	341	Textile fibers, committee on.	6
		Texan fever.	28
		Texan fever, cause of.	31
		Texan fever, outbreaks of.	29
		Testing milk.	108
		Teaching agriculture in schools.	196
		Temperature of milk.	295
		Temperature for seeds.	313
		Total solids in milk.	110
		Township loans.	149
		Township roads.	150
		Treatment of potato blight.	41
		Treatment of peach rot.	41
		Treatment of colic.	103
		Treatment of peach yellows.	132
		Treatment of peach trees.	146
		Trees, effect of on streams.	207
		Tympanitis, treatment of.	183
Sampling fertilizers.	58		
Salting butter.	79		
Salting with brine.	83		
Salt in cheese.	86		
Salt an antiseptic.	104		
Sanitarian, report of.	104		
Separator milk, sale of.	108		
Selling milk.	200		
Seeds, how preserved.	312		
Seeds, life of.	311		
Short-horn cows.	78		
Sheep raising for profit.	236		
Sheep, breeds of.	237		
Sheep as weed destroyers.	238	Unnecessary waste of wood.	124
Sheep manure, value of.	238	Unwise legislation.	193
Sheep, barn for.	239	Use of improved machinery.	26
Skim milk as food.	67	Use of institute funds.	27
Skim milk, value of.	70	Use of improved rations.	57
Skim milk, specific gravity of.	295	Use of absorbents in stables.	166
Skim milk, composition of.	113		
Solution of lime.	107		
Solids in milk.	114		
Sorters for potatoes.	227		
Spraying for black rot.	90		
Spasmodic colic.	102		
Splenic apoplexy.	181	Wanklyn's method.	109
Specific gravity of milk.	295	Weight of salt in butter.	82
Specialties at fairs.	224	Weight of fat in milk.	90
Spraying apple trees.	279	Web worms.	96
Spraying for mildew.	282	Western competition.	256
Spraying, cost of.	285	Wheat, crop of 1893.	19
Spores on trees and vines.	282	Wheat, low prices of.	19
Standing committees, list of.	6	Wheat, unprofitable.	19
Straw as stock food.	55	Whitewash as a disinfectant.	105
Straw, value of as food.	55	Whey and butter-milk.	109
Straw, protein in.	56	Whey, analysis of.	114
Steers, rations for.	57	Wire worms.	98
Storing liquid manure.	166	Wire worm parasites.	98
Stone in roads.	171	Wire worm, larval period of.	98
Statement of rainfall.	209	Winter dairying.	290



CRYOLITE. (4 Years Old.)

Owned by IRA BLOOM, Ebensburg, Cambria Co., Pa. First Premium, Pennsylvania State Agricultural Society,

"General Purpose," Class 7, Indiana, Pa., 1893.

MINUTES OF THE TRANSACTIONS
OF THE
PENNSYLVANIA
STATE AGRICULTURAL SOCIETY,
1893.

OFFICERS OF THE SOCIETY FOR 1893.

PRESIDENT.

JOHN McDOWELL, Washington, Washington county, Pa.

FIRST VICE PRESIDENT.

DAVID H. BRANSON, Atglen, Chester county, Pa.

VICE PRESIDENTS.

- | | |
|--|--|
| 1. Geo. Handy Smith, Philadelphia. | 16. Joel A. Herr, Cedar Spring, Centre county. |
| 2. Thomas J. Jordan, Philadelphia. | 17. |
| 3. Benj. S. Kunkle, Philadelphia. | 18. John S. Miller, Huntingdon, Huntingdon county. |
| 4. Chas. E. Voorhees, Philadelphia. | 19. Hiram Young, York, York county. |
| 5. L. H. Twaddell, Philadelphia. | 20. John A. Lemon, Hollidaysburg, Blair county. |
| 6. David H. Branson, Atglen, Chester county. | 21. George Rhey, Millwood, Westmoreland county. |
| 7. William H. Holstein, Bridgeport, Montgomery county. | 22. W. W. Speer, Pittsburg. |
| 8. Geo. D. Stitzel, Reading. | 23. Jos. McKean, Pittsburg. |
| 9. William Taylor, Womelsdorf, Berks county. | 24. John Biesecker, Jenner's x Roads, Somerset county. |
| 10. B. J. McGrann, Lancaster, Lancaster county. | 25. J. D. Kirkpatrick, North Liberty, Mercer county. |
| 11. D. J. Waller, Bloomsburg, Columbia county. | 26. J. C. Thornton, Fairview, Erie county. |
| 12. H. H. Colvin, Dalton, Lackawanna county. | 27. William Powell, Springboro', Crawford county. |
| 13. A. D. Hay. | 28. John A. Woodward, Harrisburg. |
| 14. Gabriel Hiester, Estherton, Dauphin county. | |
| 15. Joseph Plollet, Wysox, Bradford county. | |

AT-LARGE.

Thomas J. Edge, Harrisburg, Dauphin county.	James Young, Middletown, Dauphin county.
---	--

ADDITIONAL MEMBERS, EXECUTIVE COMMITTEE.

C. H. Bergner, Harrisburg.	E. K. Meyers, Harrisburg.
Jno. H. Ziegler, Harrisburg.	T. A. Correll, Harrisburg.
S. B. Rutherford, Harrisburg.	
J. Schall Wilhelm, York, York county, Corresponding and Recording Secretary.	A. L. Kennedy, Philadelphia. Chemist and Geologist.
W. F. Rutherford, Harrisburg, Treasurer.	W. H. Egle, Harrisburg, Librarian.
	J. C. Overmiller, Harrisburg, Stenographer.

LIFE MEMBERS.

ACTIVE.

Adney, W. H. G., Washington.
 Allen, Jno. F., Harrisburg.
 Allen, Jno. H., Montourstown.
 Alricks, Wm. K., Harrisburg.
 Andrews, E., Williamsport.
 Anspach, J., Jr.
 Armstrong, William H., Philadelphia.
 Armstrong, W. H., Easton.
 Archer, W. L., Burgettstown.
 Ashbridge, J. D., West Chester.
 Ashbridge, E. B., Goschen, Pa.

DECEASED.

Ackley, Thomas W., Philadelphia.
 Allen, Robert P., Williamsport.
 Allen, Chas., Williamsport.
 Andrews, D. S., Williamsport.
 Armstrong, James, Williamsport.
 Ayers, J. J., Williamsport.

UNKNOWN.

Allen, W. H., Agricultural College.
 Andrews, James, Hogestown.
 Allen, John E., Harrisburg.

ACTIVE.

Baker, J. B., Downingtown.
 Baker, J. B., Jr., Downingtown.
 Bailey, John T., Philadelphia.
 Bailey, Chas. L., Harrisburg.
 Baker, D., Upsonville.
 Banker, J., Upsonville.
 Barbour, J. B., Franklin, Pa.
 Bard, Edwin Milford, Philadelphia.
 Bates, Abram, Harrisburg.
 Beaver, James A., Bellefonte.
 Bell, William, Mifflin.
 Bennett, James, Pittsburg.
 Berkenbine, Samuel, Northumberland.
 Berry, John J., Williamsport.
 Bergner, C. H., Harrisburg.
 Biddle, Chas. M., Philadelphia.
 Biddle, Craig, Philadelphia.
 Biddle, Alexander, Philadelphia.
 Billings, James B., Philadelphia.
 Bolden, George, Philadelphia.
 Bomberger, Jacob C., Harrisburg.
 Bound, David T., Shickshinny, Pa.
 Boyd, T. S., Easton.
 Boyd, S. T., Easton.
 Boyd, J. F., Chambersburg.
 Boyer, W. W., Harrisburg.
 Boyer, Geo. W., West Fairview.
 Buehler, Charles, Harrisburg.
 Bush, L. L., Newton.
 Blight, Charles, Falls of Schuylkill.
 Branson, D. H., Atglen.
 Brown, Jacob B., Maytown, Pa.
 Brown, James V., Williamsport.
 Brown, James C., New Greenville.
 Brock, William Penn, Philadelphia.
 Brady, George, Sharpsburg.

DECEASED.

Baldwin, W. A., Williamsport.
 Barto, Tobias, Reading.
 Beck, John B., Williamsport.
 Bell, Samuel, Reading.
 Benson, G. S., Philadelphia.
 Bercaw, Abraham, Easton.
 Bittenbender, Stephen, Shamokin.
 Boal, George, Boalsburg.
 Bowman, Samuel, Wilkesbarre.
 Butt, Charles H., Williamsport.
 Blair, Horace G., Williamsport.
 Brown, Jacob, Newberry.
 Brown, G. W., M. D., Port Carbon.
 Brautigam, William, Northumberland.
 Bryson, George, Carlisle.

UNKNOWN.

Beard, Henry, Williamsport.
 Bender, George, Germantown.
 Brown, George H., Philadelphia.
 Brown, W. C., Titusville.
 Breeze, N. W., Wyoming.

ACTIVE.

Calder, James, Rev., Harrisburg.
 Cameron, Simon B., Middletown.
 Cameron, J. D., Harrisburg.
 Campbell, Hugh, Philadelphia.
 Canfield, Ezra, Williamsport.
 Carpenter, George, Jr., Philadelphia.
 Carpenter, E. P., Allegheny City.
 Cassett, A. J., Philadelphia.
 Coburn, J. P., Aaronsburg.
 Coleman, Fletcher, Williamsport.
 Colestock, Samuel J., Harrisburg.
 Comfort, J. C., Shiremanstown.
 Comfort, E., Philadelphia.
 Cooper, E. M., Philadelphia.
 Coover, John B., Mechanicsburg.
 Coryell, John B., Williamsport.
 Corson, George N., Norristown.
 Cummings, A. Boyd, Philadelphia.
 Cummings, R. D., Philadelphia.
 Culver, W. B., Scranton.
 Chase, A. C., Syracuse, N. Y.
 Chambers, Cyrus, Jr., Overbrook.
 Child, S. S., Harrisburg.
 Christ, Amos H., Philadelphia.
 Clark, James, Williamsport.
 Clay, M. L., Renovo.
 Clopper, F. Y., Greensburg.
 Cluly, William, Pine Grove.
 Crawford, M. H., Philadelphia.
 Crawford, Albert, Philadelphia.

DECEASED.

Campbell, John R., Williamsport.
 Campbell, E. B., Jersey Shore.
 Capron, E. W., Williamsport.
 Carlisle, Robert M., Philadelphia.
 Carter, Wm. N., Jersey Shore.
 Coder, N. B., Williamsport.
 Colton, Henry, Williamsport.

Connelly, John, Hyde Park.
 Clayton, William, Pine Grove.
 Craig, Hugh, Philadelphia.
 Crays, Samuel M., Williamsport.
 Crawford, A. S., Williamsport.

UNKNOWN.

Calvin, Otis P., New York city.
 Callahan, George, Philadelphia.
 Campbell, James R., Philadelphia.
 Campbell, Wm. S., Philadelphia.
 Campbell, Thompson, San Francisco, Cal.
 Cassell, Jacob, Harrisburg.
 Cassidy, Joseph A., Philadelphia.
 Curwen, John, Warren.
 Cummings, Chas., Harrisburg.
 Charles, J. S., Pittsburg.
 Chambers, Andrew, Philadelphia.
 Chess, Moses, Temperanceville.
 Chrisman, R. R., Harrisburg.
 Clark, Edward S., Philadelphia.
 Clark, James, Harrisburg.
 Cramer, Jacob, Uniontown.

ACTIVE.

Dallett, John, Philadelphia.
 Darlington, H., Pittsburg.
 Dateman, Robert, Milton.
 Davis, Atlee G., Philadelphia.
 Davis, A. B., Philadelphia.
 Davis, E. W., Philadelphia.
 Deal, Daniel, Philadelphia.
 Dietz, George A., Olden, Mo.
 Deltry, H. F., Philadelphia.
 Demming, H. C., Harrisburg.
 Dempster, Robert, Phillipsburg, N. J.
 DeHaven, Jehu, Harrisburg.
 Diehl, J. E., Philadelphia.
 Dillingham, J. B., West Chester.
 Dittman, Joseph G., Philadelphia.
 Doyle, Jas. B., Philadelphia.
 Downing, Thomas H., New York city.
 DuBarry, J. N., Philadelphia.
 Dull, J. J., Harrisburg.
 Dunlap, H. E., Newberry.
 Durar, Enoch, Philadelphia.
 Dreer, William F., Philadelphia.
 Dresbach, Daniel G., Scranton.

DECEASED.

Davis, William L., Easton.
 Davis, John L., Newberry.
 Devereux, James, Philadelphia.
 Devereux, John, Philadelphia.
 Dewees, John, Shamokin.
 Dickey, Samuel, Oxford.
 Dickey, E. V., Oxford.

UNKNOWN.

Dasher, David, Harrisburg.
 Davis, Joseph H., Pittsburg.
 Duncan, J. L., M. D., Pittsburg.

ACTIVE.

Early, Martin, Palmyra.
 Early, S. D., Harrisburg.
 Eddy, George W., Philadelphia.

Edge, Thomas J., Harrisburg, Pa.
 Egle, W. H., M. D., Harrisburg.
 Eli, Richard E., Philadelphia.
 Ellis William, Philadelphia.
 Eldred, Charles D., Muncy.
 Elliott, William G., Williamsport.
 Elliott, B. H., Perryville.
 Elsor, D. B., Williamsport.
 Embick, Frederick E., Williamsport.
 Emminger, John, Harrisburg.
 Engle, Charles K., Philadelphia.
 Ensminger, John T., Harrisburg.
 Englebert, A. F., Wisconsin.
 Etter, B. F., Harrisburg.
 Ever, Andrew, Muncy.
 Eves, George S., Williamsport.
 Evender, Thomas, Williamsport.

DECEASED.

Eberly, Christian, Eberly's Mills.
 Edwards, Charles, Williamsport.
 Eichbaum, William, Pittsburg.
 Ensforth, L. A., Williamsport.
 Elder, Mathias, Williamsport.
 Everhart, J. T., Pittston.

UNKNOWN.

Elliott, W. R., Pittsburg.
 Eppes, W. J., Williamsport.
 Estep, J. P., Pittsburg.
 Evans, David, Philadelphia.
 Eveland, S. D., Williamsport.

ACTIVE.

Fager, George C., Harrisburg.
 Failes, George, Philadelphia.
 Fairweather, Wm., McLean, Erie county.
 Farnum, J. E., Philadelphia.
 Farrell, John, Pittsburg.
 Farrell, John, Philadelphia.
 Fertig, John, Titusville.
 Fesler, Phillip, Williamsport.
 Filler, John H., Philadelphia.
 Fisler, J. E., Harrisburg.
 Fisler, Amos, Harrisburg.
 Flenniken, J. C., Clay Centre, Kan.
 Ford, A. E., Philadelphia.
 Foresman, D. F., Allenwood, Pa.
 Forster, Frank E., Philadelphia.
 Frantz, Jacob, Mount Hope.
 Frisch, B., Harrisburg.

DECEASED.

Felton, S. M., Philadelphia.
 Fisher, John S., Williamsport.
 Flemming, Robert, Williamsport.
 Forseman, Robert M., Williamsport.
 Foresman, D. W., Williamsport.
 Foresman, John, Williamsport.
 Fulton, Andrew, Pittsburg.
 Fuller, J. W., Montoursville.

UNKNOWN.

Fass, George, Allegheny City.
 Fiske, A. R., New York City.
 Flickinger, Samuel, Harrisburg.
 Foresman, R. S., Williamsport.

ACTIVE.

Garman, Samuel, Renovo.
 Garman, John, Hyde Park.
 Garrett, Walter E., Philadelphia.
 Germyn, John, Scranton.
 Gilbert, Henry, Harrisburg.
 Gillingham, Joseph E., Philadelphia.
 Glatz, A. Hiestand, York.
 Glenn, Robert A., Noblestown.
 Goe, John S., Tippecanoe.
 Goe, John S., Jr., Tippecanoe.
 Gohl, A., Harrisburg.
 Gowen, F. B., Philadelphia.
 Grigg, John Warner, Philadelphia.
 Griest, Chas. W., York Sulphur Springs.
 Grout, H. T., Philadelphia.
 Gross, D. W., Harrisburg.
 Grove, M. M., Harrisburg.

DECEASED.

Garber, Jacob B., Columbia.
 Garis, David, Easton.
 Gilmore, Joseph, Williamsport.
 Gibson, John, Williamsport.
 Gibbs, J. W., M. D., Hyde Park.
 Gould, Stephen, Williamsport.
 Gould, Robert S., Williamsport.
 Gould, Alex. S., Hickory Run.
 Goodwin, M., Philadelphia.
 Gregg, Theodore, Bellefonte.
 Grier, James, Newberry.
 Griffin, Henry, Scranton.

UNKNOWN.

Gardner, Jacob, Pittsburg.
 Gaynor, Edward J., Easton.
 Gillespie, James, Philadelphia.
 Gibson, C. E., Williamsport.
 Glenn, John McDonald, Pittsburg.
 Gould, J. E., Philadelphia.
 Gould, John, Luzerne.
 Greenawalt, Alex., Allegheny City.

ACTIVE.

Hacket, John M., Easton.
 Hacker, William, Philadelphia.
 Haddock, D. J., Philadelphia.
 Haehnlen, Frederick P., Harrisburg.
 Haehnlen, William, Harrisburg.
 Haehnlen, Jacob, Harrisburg.
 Hageman, Augustus H., Williamsport.
 Hagg, Philip, Williamsport.
 Hahn, George, Lower Paxton, Dauphin county.
 Hall, George B., Philadelphia.
 Hall, John B., Williamsport.
 Hall, John W., Baltimore.
 Halstead, N., Scranton.
 Halstead, W. J., Scranton.
 Hamilton, Hugh, Harrisburg.
 Hamilton, A. Boyd, Harrisburg.
 Hamilton, Hays, St. Paul, Minn.
 Hartman, John, Williamsport.
 Harrington, T. L., Williamsport.
 Hays, J. W., Williamsport.
 Hazeltine, John, Philadelphia.
 Heaton, Wm., Jr., Philadelphia.

Hellick, Reuben, Easton.
 Herr, D. S., Harrisburg.
 Herriott, W. A., Federal P. O., Allegheny county.
 Heylman, E. G., Towanda.
 Hickok, W. O., Harrisburg.
 Hiester, A. O., Harrisburg.
 Hicks, James, Wyoming.
 Hill, Theodore, Williamsport.
 Hill, J. F., Scranton.
 Hildrup, W. T., Harrisburg.
 Hinckley, Isaac, Philadelphia.
 Hoffer, John, Harrisburg.
 Hoffman, H. B., Millersburg.
 Holliday, B. B., Elmira, N. Y.
 Hollingsworth, Samuel S., Philadelphia.
 Holstein, W. K., Bridgeport.
 Holdin, H. L., Chicago, Ill.
 Hoopes, Thomas P., Philadelphia.
 Hoopes, Clement R., Philadelphia.
 Horstman, F. O., Philadelphia.
 Horstick, John, Harrisburg.
 Houston, H. H., Philadelphia.
 Hummel, William, Harrisburg.
 Hummel, S. A., Harrisburg.
 Hunter, George W., Harrisburg.
 Hutchinson, S. Pemberton, Philadelphia.
 Huling, G., Williamsport.
 Huyck, George, Newberry.
 Hynicka, George A., Harrisburg.

DECEASED.

Haldeman, Jacob S., New Market.
 Hartman, Mathias, Catawissa.
 Harvey, Chalkley, Chad's Ford.
 Herdic Peter, Williamsport.
 Hetrick, Josiah P., Easton.
 Heck, Lewis, M. D., Dauphin.
 Hepburn, Andrew, Williamsport.
 Herburn, John, Williamsport.
 Hemmingway, E. E., Easton.
 Herr, Henry, Harrisburg.
 Hester, Joseph M., Easton.
 Higgins, William C., Williamsport.
 Hinkle, John R., Newberry.
 Hise, Adam, Williamsport.
 Hitner, H. S., Barren Hill.
 Hollenbach, George M., Wilkesbarre.
 Howell, A., Williamsport.
 Howland, Ransford, Williamsport.
 Hugus, P., Pittsburg.
 Hutchins, Thomas, Wyoming.

UNKNOWN.

Hamilton, Cyrus E., Williamsport.
 Hastings, H. S., Williamsport.
 Herdler, David, Williamsport.
 Hickman, Amos S., Monticello, Ill.
 Higgins, William V., Williamsport.
 Hoffman, H. W., Harrisburg.
 Hoffman, Philip, Philadelphia.
 Honedry, Monsein, Renovo.
 Hudson, James E., Williamsport.
 Hull, Joseph F., Hull's Mills.
 Hull, W. R., Cogan Station.
 Hutter, Wm. H., Harrisburg.

ACTIVE.

Innis, John, Easton.

UNKNOWN.

Ingersoll, Harry, Philadelphia.
Irwin, James, Philadelphia.

ACTIVE.

Jamison, Edward, Newberry.
Jamivier, Thos. G., Philadelphia.
Jarrett, John, Hepburn.
Jennison, E. P., Philadelphia.
Jetter, Tuesley, Bethlehem.
Jones, John E., Williamsport.
Jones, Samuel, Williamsport.
Jones, B. F., Pittsburg.
Jones, W. H., Philadelphia.
Jordan, Thomas J., Philadelphia.

DECEASED.

Jamison, L., Williamsport.
Jenkins, Steuben, Wyoming.
Johnson, William, Easton.
Jones, Daniel, Exeter, Luzerne county.
Jordan, John, Philadelphia.

UNKNOWN.

Jayne, Eben C., Philadelphia.
Jefford, A. H., Wyoming.
Jenkins, G. S., Wyoming.

ACTIVE.

Keeley, Jerome, Philadelphia.
Kelm, George DeB., Philadelphia.
Kennedy, A. L., M. D., Philadelphia.
Kennedy, Thomas B., Chambersburg.
Kendig, John, Philadelphia.
Kent, E. E., Syracuse, N. Y.
Kepple, John, Harrisburg.
Ketterlinus, J. W., Philadelphia.
King, Alexander, Pittsburg.
Kimball, Stephen, Philadelphia.
Kimball, J. M., Lawrence Junction, Pa.
Kinney, L., Philadelphia.
Kinsman, William H., Easton.
Kinyon, S. C., Williamsport.
Kirby, William C., Harrisburg.
Kirkpatrick, Jno. D., North Liberty.
Knapp, D. B., Williamsport.
Knight, W. H., Philadelphia.
Knight, Edward S., Philadelphia.
Knipe, Joseph F., Swinworth, Kan.
Koller, H. M., Harrisburg.
Kramer, Phillip, Philadelphia.
Kraybill, Jacob E., Kansas City.

DECEASED.

Keller, John S., Orwigsburg.
King, C. M., White Deer Mills, Centre county.
Kingsley, J. E., Philadelphia.
Kunkle, Benjamin S., Harrisburg.
Kuhn, William, Harrisburg.

ACTIVE.

Lamberton, Robert A., Bethlehem.
Landreth, Oliver, Bristol.
Landreth, Leopold, Bristol.
Landreth, Burnet, Jr., Bristol.

Landreth, Burnet, Sr., Bristol.
Landreth, S. Phillips, Bristol.
Languerrene, P. L., Philadelphia.
Leacock, J. N., Dunmore.
Leser, Frederick K., Philadelphia.
Lemon, John A., Hollidaysburg.
Levan, E., M. D., Williamsport.
Lindsey, William, Elizabeth, N. J.
Line, J. M., Allentown.
Longaker, A. B., Easton.
Longstreth, John, Emille, Pa.
Lyon, Thomas, Williamsport.

DECEASED.

Larvall, Edward, Easton.
Lee, Washington, Jr., Wilkesbarre.
Lehman, M., Williamsport.
Lentz, George W., Williamsport.
Lerch, Frederick, Easton.
Lippincott, Edward, Williamsport.
Long, H. B., Pittsburg.
Love, Samuel, Williamsport.
Lowe, Elias P., Williamsport.
Lukenbach, C. A., Bethlehem.

UNKNOWN.

Lafrance, Isaac T., Wyoming.
Logan, Millard F., Williamsport.
Long, W. J., Osceola.

ACTIVE.

Mehaffey, Lindsay, Newberry.
Magan, David, Beaver Falls.
Magee, George, Philadelphia.
Magee, James, Philadelphia.
Martin, George H., Philadelphia.
Martin, Dewees J., Allentown.
Marvin, Seldon, Erie.
Maxwell, Jacob S., Williamsport.
Mallor, Thomas, Philadelphia.
Mellon, Thomas, Philadelphia.
Meredith, James M., Maiden Creek.
Messenger, Samuel, Tatamy.
Middleton, E. P., Philadelphia.
Middleton, Richard, Harrisburg.
Miller, Larr, Grand Junction, Col.
Miller, John S., Huntingdon.
Montgomery, James, Harrisburg.
Monaghan, R. E., West Chester.
Moore, E. B., West Chester.
Moore, Andrew M., Philadelphia.
Moore, G. M., Philadelphia.
Morse, L. W., Erie.
Morse, H. S., New Orleans.
Morris, D. B., Pittsburg.
Mottet, John, Harrisburg.
Mudge, Hiram, Williamsport.
Mumma, David, Harrisburg.
Mundell, John, Philadelphia.
Murdock, A. C., Pittsburg.
Meyers, B. F., Harrisburg.
Myers, Henry, Wilkesbarre.
Meyers, Charles E., Philadelphia.
McCaughy, J. A., Philadelphia.
McClure, A. K., Philadelphia.
McCrea, William M., Philadelphia.
McCully, Francis G., Philadelphia.
McDonald, Lewis, Harrisburg.

McDowell, John, Washington, Pa.
 MacKellar, Thomas, Philadelphia.
 McKean, H. P., Philadelphia.
 McKean, Jas. S., Pittsburg.
 McLowell, Lewis, Williamsport.
 McMinn, J. M., Williamsport.
 McPherson, Edward, Gettysburg.

DECEASED.

Mackey, L. A., Lock Haven.
 Mahaffey, William J., Newberry.
 Mahaffey, David, Cogan Station.
 Marshall, William, Bellefonte.
 Marcy, Ira, Wilkesbarre.
 Merrick, George, Northumberland.
 Miller, John M., Hickory.
 Miles, James, Miles Grove.
 Monday, S. S., Williamsport.
 Moore, Wesley, Newberry.
 Morrison, S. G., Williamsport.
 Muhlenburg, H. H., Reading.
 McAllister, Archibald, Spring Furnace.
 McFarland, John, Ligonier.
 McFarland, George F., Harrisburg.
 McKean, Samuel M., Williamsport.
 McMickin, J. B., Williamsport.

UNKNOWN.

Marchard, John, Pittsburg.
 Mark, George M., Harrisburg.
 Metzgar, Wm., Harrisburg.
 Miller, J. B., Harrisburg.
 Montgomery, J. B., Williamsport.
 Munday, H. F., Williamsport.
 Mutchler, John, Easton.
 McCaine, Daniel, Allegheny City.
 McCormick, Robert, Montourville.
 McFish, A. L., Pittsburg.
 McPherson, J. S., Wilkins.

ACTIVE.

Neiman, D. H., Easton.
 Nicely, George W., Newberry.
 Nichols, W. F., Williamsport.
 Nissley, John F., Hummelstown.
 Nutting, Lyman, Pine Grove, Schuylkill county.

DECEASED.

Noble, John, Carlisle.
 Noble, F. W., Easton.

UNKNOWN.

Neilson, Robert, Philadelphia.
 Newton, G. B., Springfield, Delaware county.
 Nichols, James, Williamsport.
 Nissley, Joseph, Harrisburg.

ACTIVE.

Odenweider, H. L., Easton.
 Olewine, Benjamin, Harrisburg.
 Ott, Leander, Harrisburg.

DECEASED.

Opp, George S., Maryland, Lycoming county.
 Osttott, Jacob H., Harrisburg.

ACTIVE.

Palmer, Henry, Avondale.
 Parsons, H. C., Williamsport.
 Parsons, George W., Harrisburg.
 Patterson, Lebanon Church, Allegheny county.
 Pennock, Samuel, Kennett Square.
 Perkins, H. J., Williamsport.
 Perrott, W. S., Philadelphia.
 Peters, C. P., Philadelphia.
 Peyson, Augustus P., Philadelphia.
 Phelps, W. H., Etna borough, Pa.
 Phillips, John, Allegheny City.
 Polln, Albert, Wyoming.
 Pomroy, John L., Philadelphia.
 Post, G. S., Williamsport.
 Porter, John F., Williamsport.
 Postlethwaite, E. T., Philadelphia.
 Potts, E. Channing, Philadelphia.
 Pratt, Thomas, Philadelphia.
 Presbury, George G., Jr., Philadelphia.
 Pyle, R. C., Easton.

DECEASED.

Page, A., Williamsport.
 Parke, John E., Pittsburg.
 Patterson, Robert H., Pittsburg.
 Patterson, John, Glenmore.
 Perkins, James E., Lamar.
 Pollock, Samuel, Williamsport.
 Pritchett, Barrodale, Frazier.
 Purcell, Sylvester, Bloomsburg.

UNKNOWN.

Parsons, H. K., Harrisburg.
 Parsons, Leroy, Harrisburg.
 Parker, Samuel J., Williamsport.
 Pemberton, Clifford, Pittsburg.
 Pennock, Joseph, Harrisburg.
 Pownell, Ambrose, Philadelphia.

ACTIVE.

Rank, L. D., Newberry.
 Raymond, Jas., Harrisburg.
 Reed, E. W., Erie.
 Reighard, Daniel, Newberry.
 Reiley, John A., Harrisburg.
 Reel, Augustus, Harrisburg.
 Reminger, W. H., Williamsport.
 Rhey, George, Millwood.
 Rhodes, William A., Philadelphia.
 Richards, Henry, Easton.
 Richmond, William H., Richmond City, Pa.
 Roberts, George B., Philadelphia.
 Robinson, T. F., Philadelphia.
 Rodgers, Fairman, Philadelphia.
 Rodenbaugh, James S., Easton.
 Rogers, C. B., Philadelphia.
 Rogers, Lucius, Smethport.
 Robers, Felix, Green Tree.
 Roth, Jeremiah, Allentown.
 Rudy, Joseph, Harrisburg.
 Rudman, William C., Philadelphia.
 Runk, William M., Philadelphia.
 Rupp, H. S., Shiremanstown.
 Rutter, Nathaniel, Wilkesbarre.

Rutherford, W. F., Harrisburg.
 Rutherford, William S., Harrisburg.
 Rutherford, F. W., Harrisburg.
 Rutherford, J. F., Harrisburg.
 Rutherford, Silas B., Harrisburg.
 Rutherford, J. Q. A., Harrisburg.
 Rutherford, S. Parke, Cochranville,
 Chestre county.

DECEASED.

Reed, Alexander, Lock Haven.
 Reed, Mrs. A. H., Easton.
 Reighard, James, Newberry.
 Reel, John, Harrisburg.
 Ross, William S., Wilkesbarre.
 Rouse, William A., Harrisburg.
 Rowley, Thomas A., Pittsburg.
 Ruggles, A. C., Williamsport.
 Rutherford, Abner, Harrisburg.
 Rutherford, Abner, Harrisburg.
 Rutherford, John B., Harrisburg.

UNKNOWN.

Reigel, James, Easton.
 Risler, S. D., Philadelphia.
 Road, Jacob, Pittsburg.
 Roberts, Algernon S., Philadelphia.
 Rogers, C. R., Philadelphia.
 Rood, D. N., Williamsport.

ACTIVE.

Saxton, J. O., Mechanicsburg.
 Savery, Peleg B., Philadelphia.
 Schall, David, Norristown.
 Schreiner, J. W., Lewisburg.
 Schasley, J. B., Wyoming.
 Scull, Gideon, Philadelphia.
 Scott, W. H., Philadelphia.
 Serch, David, Easton.
 Shaffer, William S., Harrisburg.
 Shaner, Jefferson, West Chester.
 Sharp, James W., Philadelphia.
 Shark, John, Jr., Wyoming.
 Sharpless, S. J., Street Road, Chester
 county.
 Sheffler, A. G., Williamsport.
 Sheesley, W. F., Harrisburg.
 Shoemaker, John J., Harrisburg.
 Showers, Jesse, Rauchtown.
 Shryock, W. Knight, Philadelphia.
 Silkman, W. M., Scranton.
 Silverthorn, M. H., Erie.
 Simon, J. B., Harrisburg.
 Singer Manufacturing Company, Phila-
 delphia.
 Singerly, W. M., Philadelphia.
 Slade, Alfred, Philadelphia.
 Small, Henry, York.
 Smith, George Handy, Philadelphia.
 Smith, Daniel, Jr., Philadelphia.
 Smith, Phillip L., Philadelphia.
 Smith, William B., Philadelphia.
 Smith, Mahlon K., Philadelphia.
 Smith, J. B., Dunmore.
 Smith, J. D. L., Mill Hall.
 Smith, Jacob, Harrisburg.
 Snow, Edward K., Philadelphia.
 Snyder, Daniel W., Easton.

Sower, F. D., Norristown.
 Spencer, S. S., Lancaster.
 Speer, William W., Allegheny City.
 Stearns, L. L., Williamsport.
 Steel, John M., Greensburg.
 Steel, William, Greensburg.
 Stephens, Z., Scranton.
 Stokes, T. C. P., Philadelphia.
 Strouble, Jacob, Jersey City.
 Stuart, George H., Philadelphia.

DECEASED.

Schrelber, O. L., Laubach.
 Scott, John, Pittsburg.
 Seltz, George, Easton.
 Seltz, Frederick, Easton.
 Seler, Daniel W., Harrisburg.
 Seltzer, George L., Myerstown.
 Shaw, Hugh, Jersey Shore.
 Sheets, J. H. Van, Orwigsburg.
 Shoemaker, William M., Wyoming.
 Shoemaker, Elijah, Kingston.
 Smith, Henry B., Williamsport.
 Smith, Thomas, Williamsport.
 Smith, Daniel, Williamsport.
 Smith, James W., Newberry.
 Stanbaugh, S. C., Lancaster.
 Starr, Isaac, Philadelphia.
 Sturdevant, E. W., Wilkesbarre.

UNKNOWN.

Sigman, James, Easton.
 Shoemaker, William S., Wyoming.
 Smith, H. K., Philadelphia.
 Smith, George, New York City.
 Stewart, Robert, Lima.
 Sturdevant, E. J., Wyoming.
 Swan, Rufus C., Williamsport.
 Swift, Joseph, Philadelphia.

ACTIVE.

Tatham, H. B., Philadelphia.
 Taylor, Horace E., Williamsport.
 Taylor, William, Womelsdorf.
 Taylor, B. Frank, Womelsdorf.
 Taylor, George R., Robesonia.
 Templin, Wm., Harrisburg.
 Thatcher, Richard, Darby, Delaware
 county.
 Thayer, Russell A., Allentown.
 Thompson, Frank, Philadelphia.
 Towers, William H., Philadelphia.
 Touzand, Monsieur J., Chateau Ray.
 Trump, Edward D., Jersey Shore.
 Trump, Edward D., Jersey Shore.
 Twaddell, L. H., Philadelphia.
 Tyson, Carroll S., Philadelphia.

DECEASED.

Tasker, Thomas T., Philadelphia.
 Tatham, George N., Philadelphia.
 Taylor, Benjamin H., Williamsport.
 Templin, James R., Easton.
 Thompson, John I., Half Moon, Centre
 county.
 Thompson, N. B., Philadelphia.
 Thompson, James, Cogan Station.
 Thomas, Richard, Whitford, Chester

county.
Tinsmann, Garrett, Williamsport.
Tripp, Ira, Scranton.

ACTIVE.

Updegraff, Daniel, Newberry.

DECEASED.

Updegraff, Thomas, Newberry
Updegraff, Derrick, Newberry.
Urgenhart, John, Wilkesbarre.
Unger, John H., Harrisburg.

UNKNOWN.

Updegraff, A., Wilkesbarre.

ACTIVE.

VanLeer, Isaac, Wallace, Chester
county.

Vanhooris, H. B., Speraville, Kan.
Vanvorce, John, Williamsport.
Vollmer, Charles F., Philadelphia.
Vonger, James C., Philadelphia.

DECEASED.

Van Buskirk, S., Williamsport.
Vandyke, James, Northumberland.

UNKNOWN.

Vanscoy, Daniel, Wyoming.

ACTIVE.

Wagner, Louis, Philadelphia.
Waggoner, John A., Harrisburg.
Walker, R. J. C., Williamsport.
Walters, Townsend, West Chester.
Walter, D. J., Bloomsburg.
Wallower, John, Harrisburg.
Wanamaker, William H., Philadelphia.
Waterman, Joseph, Philadelphia.
Waterman, Albert G., Philadelphia.
Watson, Joanna, Philadelphia.
Weaver, H. A., Philadelphia.
Weikhesser, Enos, Easton.
Welsh, John, Philadelphia.
Welsh, J. Lowber, Philadelphia.
Welch, Benjamin G., Hughesville.
Whitman, Horace F., Philadelphia.
Why, John, Jr., Sewickley, Pa.
Wible, William, Gettysburg.
Williams, E. C., Chapman, Pa.
Wilhelm, J Schall, York.
Wilson, S. L., Philadelphia.

Wolf, Peter, Williamsport.
Wood, James, Williamsport.
Wright, Joshua, Washington county.

DECEASED.

Walt, B., Williamsport.
Walker, George, Montrose.
Wallace, W. W., Pittsburg.
Washington, W. P., Shamokin.
Watts, Frederick, Carlisle.
Watson, Oliver, Williamsport.
Welsh, Samuel, Philadelphia.
Wetz, Thomas H., Norristown.
White, John, Williamsport.
Wilhelm, A., York.
Williams, Sites, Wilkesbarre.
Wood, Thomas, Penningtonville.
Woodnaus, Samuel, Plymouth.
Woodward, John V, Williamsport.
Wolfinger, Levi, Harrisburg.

UNKNOWN.

Weaver, M. B., Williamsport.
Wescott, Thomas S., Ashland.
Witman, Thomas J., Philadelphia.
Wilson, D. Y., Green Tree, Chester
county.
Wingard, Samuel C., Williamsport.
Wolf, William, Harrisburg.
Wood, Robert, Philadelphia.

ACTIVE.

Yeager, Joseph, Philadelphia.
Yeaton, William H., Philadelphia.
Young, Alexander, Philadelphia.
Young, William, Easton.
Young, James, Middletown
Young, Hiram, York.
Young, John, Jr., Shoustown, Allegheny
county.
Young, A. P., Millville, Columbia
county.
Youngman, George W., Williamsport.

ACTIVE.

Zerbe, Cyrus, Steelton.
Zeigler, John H., Harrisburg.

DECEASED.

Zimmerman, F., Williamsport.

UNKNOWN.

Zimmerman, A. M., Harrisburg.

ACT OF INCORPORATION AND BY-LAWS

OF THE

Pennsylvania State Agricultural Society.

AN ACT

To incorporate the Pennsylvania State Agricultural Society.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by authority of the same,* That George W. Woodward, James Irvin, E. A. Thompson, Frederick Watts, T. J. Bingham and others, who have subscribed the constitution lately adopted by a convention assembled at Harrisburg, to improve the condition of agriculture, horticulture and the household arts, be, and they are hereby created a body politic and corporate in law, by the name of "The Pennsylvania State Agricultural Society," and by that name shall have perpetual succession, and have capacity to sue and be sued, and may have a common seal, which at their pleasure may alter or renew; they may take by gift, grant, devise, bequest or otherwise, lands and tenements, goods and chattels, necessary for all the purposes for which the society was instituted: *Provided,* The annual income therefrom shall not exceed ten thousand dollars, independent of annual contributions by members, and the same to convey, layout, apply and dispose of, for the benefit of said society, as they, under their charter and by-laws may direct.

Incorporators.

Title.

Corporate powers.

Annual income.

Disposal of same.

SECTION 2. That the members of the said corporation shall have power to make and enforce such constitution and by-laws as may be necessary for the good government of the society, and the same from time to time to revoke, alter and amend, as they may think proper: *Provided,* That the same shall not be inconsistent with the constitution and laws of this State.

By-laws.

SECTION 3. That the sum of two thousand dollars, out of any money in the treasury not otherwise appropriated, be and the same is hereby appropriated to the said society; and annually hereafter a sum of equal amount to that paid by the members thereof into its

State appropriation.

treasury, affidavit of which fact, and the amount so raised by the treasurer of the society, being first filed with the State Treasurer: *Provided*, Such sum shall not exceed two thousand dollars in any one year.

County agricultural societies.

SECTION 4. That when any number of individuals shall organize themselves into an agricultural or horticultural society, or any agricultural or horticultural society now organized within any of the counties of this Commonwealth shall have adopted a constitution and by-laws for their government, elected their officers, and raised annually, by the voluntary contributions of its members, any sum of money, which shall have been actually paid into their treasury, for the purpose of being disbursed for the promotion of agricultural knowledge and improvement, and that fact be attested by the affidavit of their president and treasurer, filed with the commissioners of the county, the said county society shall be entitled to receive annually a like sum from the treasurer of their said county: *Provided*, That said annual payment out of the county funds shall not exceed one hundred dollars: *Provided further*, That but one such society in any county shall be entitled to receive such appropriation in any one year, under this act.

County appropriation.

Limitations.

Duty of president.

SECTION 5. That the President of the Pennsylvania State Agricultural Society, who shall receive or expend any of the moneys hereby appropriated, shall annually, on the first Monday of January, transmit to the Governor of the Commonwealth a detailed account of the expenditures of all the moneys which shall come into his hands under this act, and stating to whom and for what purpose paid; and a copy of the said report shall be transmitted to the Legislature at as early a day as practicable, and the original shall be filed in the office of the Secretary of the Commonwealth. And the presidents of the several county agricultural societies shall annually transmit, in the month of December, to the executive committee of the Pennsylvania State Agricultural Society, all such reports or returns as they are required to demand and receive from applicants for premiums, together with an abstract of their proceedings during the year. This act shall at all times be within the power of the Legislature to modify, alter or repeal the same.

Duty of presidents of county agricultural societies.

JOHN CESSNA,

Speaker of the House of Representatives.

BENJAMIN MATTHIAS,

Speaker of the Senate.

APPROVED—The twenty-ninth day of March, Anno Domino one thousand eight hundred and fifty-one.

WM. F. JOHNSON.

CONSTITUTION AND BY-LAWS

OF THE

Pennsylvania State Agricultural Society.

The name of the society shall be the PENNSYLVANIA STATE AGRICULTURAL SOCIETY. The objects of this society are to foster and improve agriculture, horticulture, and the domestic and household arts.

Title.
Objecta.

WHO ARE MEMBERS.

SECTION 1. The society shall consist of all such persons as shall pay to the treasurer not less than two dollars, and annually, thereafter, not less than two dollars; and also, of honorary and corresponding members, the names of the members to be recorded by the secretary.

Members.

The officers of the county agricultural societies in this State, or delegations therefrom, shall be members *ex officio* of this society.

The payment of fifty dollars shall constitute a life membership, and exempt the members so contributing from all annual payments.

Life members.

OFFICERS.

SECTION 2. The officers of this society shall be president, vice president from each congressional district, three-fourths of whom shall be practical agriculturists or horticulturists, a treasurer, a corresponding secretary, a recording secretary, a librarian, an agricultural chemist and geologist, and such assistants as the society may find essential to the transaction of its business; an executive committee, consisting of the above named officers, five additional members, with the ex-presidents of the society, all of whom shall be elected at the annual meeting in January by the qualified members of the society.

Officers.

When elected.

OF THE PRESIDENT.

SECTION 3. The president shall have a general superintendence of all the affairs of the society.

President's duties

FIRST VICE PRESIDENT.

Election of and duties
of the first vice presi-
dent.

That at the annual election of this society there shall be elected from one of the number of vice presidents, one of said officers to act as first vice president, whose duty it shall be to act as president in case of the absence or death of the president.

EX-PRESIDENTS.

Ex-presidents.

That whenever the number of ex-presidents exceeds five (5) the name receiving the lowest number of votes shall be the one dropped from the list of officers.

OF THE VICE PRESIDENTS.

Duties of vice presi-
dents.

It shall be the duty of the vice presidents to take charge of the affairs of the association in their several districts; to advance all its objects; to call upon farmers to report as to the condition of agriculture in their neighborhood; to ask for information as to the modes of cultivation adopted by different farmers; and, as far as in their power, to make known the resources of their districts, the nature of its soil, its geological character, and all such matter as may interest farmers in every part of the State.

TREASURER.

Duties of treasurer.

The treasurer shall keep an account of all moneys paid into his hand, and shall pay bills when audited and approved by the executive committee. Each order for payment must be signed by the president or chairman of the executive committee.

CORRESPONDING SECRETARY.

Duties of correspond-
ing secretary.

The duty of this officer shall be to invite a correspondence with all persons interested in agriculture, whether in the State of Pennsylvania or elsewhere, but especially with our consuls in foreign countries, that new seeds, vegetables or live stock may be introduced and their fitness for cultivation and propogation in our climate be tested. At each stated meeting of the society he shall read his correspondence, which shall, either the whole, or such parts as may be selected by the society, form a portion of the transactions. He shall also correspond with the president or other officers of each state society in the United States, at least twice in the year, for the purpose of combined and mutual action, and to be informed of the results and progress of each other's efforts; also, to invite mechanics to forward models or implements for examination or trial.

RECORDING SECRETARY.

Duties of recording sec-
retary

The recording secretary shall keep the minutes of the society and of the executive committee. At the close of each year he shall prepare for publication such

parts of the minutes and transactions of the society as may be designated. The recording secretary shall have power to approve of such bills and contracts as he is authorized to make, and the treasurer shall pay the same.

Powers of recording secretary.

LIBRARIAN.

The librarian shall take charge of all books, pamphlets, etc., belonging to the society, and shall act as curator to preserve seeds, implements, or whatever property the society may possess.

Duties of librarian.

In case of the death of any of the officers of this society, the president shall have power to fill the vacancy by appointment until the next annual meeting of the society.

Vacancies—how filled.

EXECUTIVE COMMITTEE AND QUORUM.

The executive committee shall transact the business of the society generally; shall superintend and direct the publication of such of the reports and transactions as they may deem proper, and shall designate the time and places for annual exhibitions, regulate the expenditures, examine all accounts, and keep such general charge of the affairs of the society as may best promote its interests.

Duties of executive committee.

They shall select their own chairman, and meet quarterly, and at any other time when convened by the president; five members shall form a quorum.

Quorum of executive committee.

They shall call special meetings of the society when necessary.

Special meeting of society.

ANNUAL MEETING OF THE SOCIETY AND QUORUM.

SECTION 4. The society shall meet annually, on the third Wednesday of January, at Harrisburg, when all the officers of the society, not otherwise appointed, shall be elected by ballot for the ensuing year, and until another election. The polls shall be opened at ten a. m., and closed at twelve o'clock m., when the result of the election shall be announced. They shall also hold a general meeting at the time of the annual exhibitions, and special meetings whenever convoked by the executive committee.

Annual meeting of society—when held.

Mode of electing officers

General and special meeting.

Fifteen members shall form a quorum for the transaction of business, but no member in arrears shall be entitled to the privileges of the society.

Quorum of society.

QUALIFICATIONS OF VOTERS.

SECTION 5. No annual member, hereafter, shall be entitled to vote for the election of officers of the Pennsylvania State Agricultural Society unless he shall have been a member of the previous State fair, and in default of a State fair, then three months' previous membership shall be necessary.

Qualifications of voters

Eligibility.

SECTION 6. No one shall be eligible to office hereafter who has not obtained a right to vote under section five.

ALTERATIONS.

Alterations and
amendments.
Vote necessary to

SECTION 7. This constitution may be altered or amended at the annual meetings in January by a vote of two-thirds of the members in attendance.

Must be submitted to
executive committee.

All amendments to the constitution, to be voted upon at the annual meeting of the society in January, must be submitted to the meeting of the executive committee in September preceding said annual meeting.

MINUTES OF THE TRANSACTIONS
OF THE
Pennsylvania State Agricultural Society,
1893.

PROCEEDINGS OF THE EXECUTIVE COMMITTEE.

Tuesday Evening, January 17, 1893.

The Executive Committee met in regular session at 7.30 o'clock, p. m. Members present, Messrs. President McDowell, Secretary Wilhelm, Treasurer Nissley, First Vice President W. F. Rutherford, Vice Presidents C. H. Bergner, David H. Branson and Hiram Young. Stenographer to the Secretary J. C. Overmiller and Mr. J. Paul Nissley were also present.

The reading of the minutes of the preceding meetings was, on motion, dispensed with.

Treasurer Nissley presented his report for the year, which was read by Secretary Wilhelm; on motion the same was approved, and referred to the meeting of the society on the morrow.

On motion of Vice President Bergner, seconded by Vice President Rutherford, it was agreed that some one be deputized to draw the secretary's salary.

Vice President Bergner offered the following motion: "That the order of \$200, in favor of Secretary Wilhelm for money advanced, which order was granted at a special meeting of the committee, be revoked;" seconded by First Vice President Rutherford and agreed to.

Vice President Bergner also offered the following resolution: "That an order for \$274.11 be granted Secretary Wilhelm for money advanced by him towards expenses of the Lancaster fair;" seconded by Vice President Branson and unanimously agreed to.

First Vice President Rutherford offered the following resolution: "That an additional compensation of \$250 be paid the secretary for extra services," which was seconded by Vice President Branson. Before the question was put Vice President Young moved to amend by

making the amount \$500 instead of \$250, which was accepted by Vice Presidents Rutherford and Branson, and unanimously agreed to.

Vice President Bergner moved that an order for \$50 be granted to J. C. Overmiller, stenographer, for services, which was unanimously agreed to.

On motion adjourned.

J. SCHALL WILHELM,
Secretary.

MEETING OF THE SOCIETY.

The society met at 10 o'clock, a. m., Wednesday, January 18, 1893.

First Vice President Rutherford nominated Vice President Young to act as chairman; which was seconded and agreed to.

Vice President Young thereupon took the chair, and briefly thanked the society for the honor conferred upon him, and stated the first order of business to be the appointment of a judge and tellers to conduct the election. Whereupon, on motion, Hiram Young was appointed judge and S. B. Rutherford and Dr. T. A. Correll tellers.

During the balloting the following business was transacted:

Treasurer Nissley presented his accounts for the past year, and requested that auditors be appointed to examine the same. The chair appointed Hon. Geo. D. Stetzel and W. F. Rutherford as auditors. The committee made report as follows, viz:

Dr.

John J. Nissley, Treasurer, in account with Pennsylvania State Agricultural Society.

1892.

Jan. 19. Balance in treasury,	\$6,916 64
Feb. 2. To State appropriation,	2,000 00
Sept. 12. To fifty annual memberships,	100 00

Proceeds of Fair at Lancaster, Pa.:

Oct. 15. Sale of single admissions,	\$4,363 95
Contributions received at Lancaster, entry fees, prizes, &c.,	2,167 94
Railroad tickets,	945 50
Cash from concessions,	1,083 25
	<hr/>
	8,560 64
Amount due J. S. Wilhelm, secretary, cash overpaid,	274 11
	<hr/>
	\$17,851 39

Cr.

Jan.	19.	Order No. 12, D. W. Seiler, secretary, salary, . . .	3,400 00
June	4.	Order No. 10, Wm. Shireman, freight,	23 00
Oct.	17.	Payments on account of Fair at Lancaster, Pa.: Orders No. 26, 27, 28, 29, 30, 31, 32 and 33, premiums,	\$3,474 88
		Orders No. 24, 34, 35, 40, 47 and 48, expenses secretary's office and executive committee,	767 73
		Orders No. 25 and 53, lumber, chairs, etc.,	410 00
		Order No. 43, J. S. Wilhelm, secretary, bills paid as per his statement,	1,982 38
		Amount paid by J. S. Wilhelm, secretary, for bills as per his statement,	3,525 30
		Order No. 44, J. J. Nissley, treasurer, payments as per bills attached,	2,381 57
		Orders No. 50, 51 and 52, advertising and stationery,	39 50
			<hr/>
		Orders No. 5, 7, 9, 13, 14, 18, 20 and 42, expenses secretary's office, Harrisburg,	333 41
		Orders No. 1, 2, 15, 19 and 39, rent,	305 00
		Order No. 46, expenses treasurer's office,	20 60
		Orders No. 3, 6, 8, 16, 17, 21, 23, 36, 38, 41, and 49, expenses executive committee,	704 49
		Orders No. 4, 11, 12 and 13, printing and advertising,	54 26
		Treasurer's salary,	350 00
		Balance in treasury,	79 27
			<hr/>
			\$17,851 39

We, the undersigned committee, appointed to audit the account of John J. Nissley, Treasurer of the Pennsylvania State Agricultural Society, report that we have examined the charges and vouchers and find the same correct, as above stated.

Witness our hands this 18th day of January, 1893.

W. F. RUTHERFORD.
GEO. D. STITZEL.

On motion of Hon. David H. Branson, the report was received, approved and filed, and directed that it be entered upon the minutes.

Secretary Wilhelm then presented a letter from Dr. A. L. Kennedy, which was read as follows:

Office of the Chemist and Geologist,
of the Pennsylvania State Agricultural Society,
Philadelphia, January 17, 1893.

To the President and Members of the Pennsylvania State Agricultural Society, Harrisburg, Pa.

Gentlemen: At a meeting of the executive committee of the so-

ciety, held at Lancaster last October during the State Fair, I had the honor to present the preamble and resolution marked in the enclosed clipping from the editorial columns of the "Practical Farmer," a copy of which I directed to be mailed to every member of the executive committee. So important is the subject of systemizing agricultural education in our Commonwealth, that the action had by the committee should not be permitted to rest there, but should, in my judgment, be taken up and pushed by the society. Certainly in no better way can the society manifest its continued interest in agriculture, and its desire to be a co-worker in the great cause.

I therefore beg to submit the following resolutions, to be acted on at the annual meeting of the society to be held tomorrow:

1. That the society hereby endorses the action of the executive committee in favor of so extending agricultural education that it shall constitute a portion of the instruction, in one or more classes, in the graded rural common schools of the State.

2. That in order to prepare for the accomplishment of this purpose, agriculture should be introduced and made one of the studies pursued in the normal schools of the Commonwealth.

3. That a committee be appointed to lay the above measure before the Legislature at the present session of that body, and to prepare and present a bill which, if enacted, will successfully carry out all the provisions of the measure.

Such a measure, whether it succeed at this session of the Legislature or not, will tend to bring the society favorably before that body, as well as before the normal schools, the State Department of Education and other organizations.

Until last evening I had fondly anticipated the pleasure of being with you at the annual meeting. I regret to find that my engagements here will prevent my doing so, and that I must beg you to excuse my absence.

Very truly and faithfully yours,

(Signed.)

ALFRED L. KENNEDY,
Chemist and Geologist.

Copy of newspaper clipping of the resolution passed at the meeting of the Executive Committee of the Pennsylvania State Agricultural Society, held in Lancaster, October 14, 1892:

"Whereas, A knowledge of the elements of agriculture on the part of the teachers of our rural public schools would enable them to solve many questions on the subject propounded by scholars and their parents, and thus tend to remove many errors which retard the progress of our art; therefore,

Resolved, That the State and county superintendents of our common schools, and the officers of the State Normal schools be, and they are hereby, requested to make provision whereby familiar lectures on the elementary principles of agriculture shall be given to both male and female students in normal schools, in order that they may become fitted to advise pupils and people of the rural neighborhoods in which they may locate, of the nature and use of germicides, and the reasons for pursuing improved methods of husbandry."

The matter was then discussed at length by Messrs. Heister, McDowell and Wilhelm.

Mr. Wilhelm offered the following resolution: "That this society appoint a committee of three, to consist of Dr. A. L. Kennedy as chairman, Mr. John McDowell and Gabriel Heister, to present the suggestions embodied in Dr. Kennedy's letter to the Secretary of the State Board of Agriculture, and ask that a committee from that body, in conjunction with the committee referred to above, be appointed to lay the matter before the Legislature, and frame a bill for that purpose;" which was unanimously agreed to.

Mr. Wilhelm called attention to the importance of having this society represented in the State Board of Agriculture, and asked for the adoption of the following resolution, which was agreed to and referred to the Committee on Legislation, viz:

Whereas, The Pennsylvania State Agricultural Society is almost exclusively composed of agricultural and horticultural classes of this Commonwealth, and come from nearly every county; and

Whereas, The true interests of the farmer would be subserved by having said body represented on the State Board of Agriculture; therefore,

Resolved, That the Senate and House of Representatives are respectfully requested to pass a law permitting the Pennsylvania State Agricultural Society to elect three practical farmers or horticultural members of the State Board of Agriculture, said members to have the same rights and privileges as other members of the Board.

Mr. Wilhelm also asked that, in anticipation of the above preamble and resolutions, that a committee of three, to consist of Messrs. W. F. Rutherford, Hiram Young and David H. Branson, be appointed as delegates from this society to the meeting of the State Board of Agriculture in this city next week; which was agreed to.

Mr. Wilhelm also asked that a committee of three be appointed, to consist of Mr. W. F. Rutherford, Silas B. Rutherford and Dr. T. A. Correll, as delegates to represent this society at the meeting of the Agricultural Societies of Pennsylvania, to meet in the Supreme Court room, in this city, next week; which was also agreed to.

Mr. Wilhelm also asked that a committee of three be appointed, to be known as the Committee on Legislation, to take charge of, and to whom all matters of legislation on the part of the society be referred; which was seconded by Mr. W. F. Rutherford and agreed to. Whereupon the Chair appointed as that committee, J. Schall Wilhelm, chairman, C. H. Bergner and W. F. Rutherford.

Secretary Wilhelm then presented preamble and resolutions, which were offered by Col. H. C. Denning at the meeting of the executive committee at Lancaster, for the alteration of the constitution and by-laws, which was read as follows:

Amend Section 2 by inserting the word "a" in first line before the word "president;" by inserting the word "one" before the word "vice" in the second line; by striking out the word "corresponding" in the fourth line; by inserting the words "a stenographer" in lieu of the words "recording secretary" in the fifth line; by inserting the word "other" after the word "such" in the sixth line; and by inserting the word "and" before the word "five" in the sixth line.

In Section 3, to amend in the last line of the paragraph, under the heading "of the vice president," by adding "a" to the word "matter."

Under the heading of "Treasurer," to add the words at end of paragraph "or, Committee of Arrangements,"

Under the heading of "Corresponding Secretary," to strike out the word "corresponding" wherever it occurs.

Under the heading of "Recording Secretary" and in the first paragraph, to strike out the words "recording secretary" wherever they occur, and insert the word "stenographer."

To strike out the word "recording" in second paragraph; to insert after the word "same" in the third line, the words "after approval by either the President, Executive Committee or Committee of Arrangements;" and to place the whole paragraph under the heading of "Secretary."

In Section 3, under heading of "Executive Committee and Quorum," add a new paragraph, as follows: "To facilitate the business of the society or the executive committee, the executive committee can constitute a committee of arrangements of five or seven of its members, to whom all the powers of the executive committee can be conferred. Three of said committee of arrangements shall form a quorum."

Resolved, That a committee of three members shall be elected immediately, to be known as the Committee on Legislation, whose duty it shall be to prepare an amendment to the act of Assembly, approved March 29, 1851, so that the president shall not be required to submit detailed account of expenditures to the Governor until the first Monday in February of each year, instead of first Monday in January.

On motion of First Vice President Rutherford, the same was laid upon the table for future consideration. Agreed to.

Secretary Wilhelm then presented his correspondence with the presidents of the various State and local agricultural societies, which was read, and his action in having the same printed in the annual report of 1892 was endorsed.

On motion of First Vice President Rutherford, the president-elect was requested to present to the Governor, copy of the treasurer's annual statement for the year 1892, audited and approved this day, as a further and more detailed statement to the one furnished him January 2, 1893, according to law, showing the disposition of the \$2,000 appropriated by the State to the society; which was seconded by Mr. Wilhelm and agreed to.

The hour of twelve o'clock having arrived, the polls were closed, and the judge and tellers appointed to conduct the election made the following report:

Harrisburg, January 18, 1893.

We, the undersigned judge and tellers appointed to hold the annual election of officers of the Pennsylvania State Agricultural Society for the year 1893, respectfully report the following ticket elected, each member having received thirty-five votes.

(Signed.)

HIRAM YOUNG, Judge.
S. B. RUTHERFORD, Teller.
T. A. CORRELL, Teller.

President.

John McDowell,..... 35

First Vice President.

David H. Branson,..... 35

Vice Presidents.

1. Geo. Handy Smith,.....	35
2. Thomas J. Jordan,.....	35
3. Benj. S. Kunkle,.....	35
4. Chas. E. Voorhees,.....	35
5. L. H. Twaddell,.....	35
6. David H. Branson,.....	35
7. William H. Holstein,.....	35
8. Geo. D. Stitzel,.....	35
9. Wm. Taylor,	35
10. B. J. McGrann,.....	35
11. D. J. Waller,.....	35
12. H. H. Colvin,	35
13. A. D. Hay,	35
14. Gabriel Hiester,	35
15. Joseph Piollet,	35
16. Joel A. Herr,	35
17.	
18. John S. Miller,.....	35
19. Hiram Young,	35
20. John A. Lemon,	35
21. George Rhey,	35
22. W. W. Speer,	35
23. Jos. McKean,	35
24. John Biesecker,	35
25. J. D. Kirkpatrick,	35
26. J. C. Thornton,	35
27. Wm. Powell,.....	35
28. John A. Woodward,	35

At Large.

Thomas J. Edge,.....	35
James Young,	35

Additional Members Executive Committee.

C. H. Bergner,	35
Jno. H. Ziegler,	35
S. B. Rutherford,	35
E. K. Meyers,	35
T. A. Correll,.....	35

Corresponding and Recording Secretary.

J. Schall Wilhelm,	35
--------------------------	----

Treasurer.

W. F. Rutherford,	35
-------------------------	----

Chemist and Geologist.

A. L. Kennedy,.....	35
---------------------	----

Librarian.

Wm. H. Egle,.....	35
-------------------	----

Stenographer.

H. C. Demming, 35

There being a vacancy in the Thirteenth and Seventeenth districts, on motion of Secretary Wilhelm, the president was authorized to fill these vacancies; which was seconded and agreed to.

Whereupon the president appointed A. D. Hay, of the Twelfth district, to fill the vacancy in the Thirteenth district, and _____ to fill the vacancy in the Seventeenth district.

Secretary Wilhelm said he thought the thanks of the society were due to Mr. John J. Nissley, the retiring treasurer, for his long and continued service for twenty-nine years with this society, and asked that a committee be appointed to draft suitable resolutions in this direction, one of which to be sent to Mr. Nissley the other to be spread upon the minutes of the society; which was seconded and agreed to. The chair appointed as this committee C. H. Bergner, John McDowell and J. Schall Wilhelm.

The committee made the following report, which was accepted and directed to be entered upon the minutes.

Whereas, Owing to impaired health, Mr. John J. Nissley, treasurer, desires to be relieved from active duties in connection with this society; therefore, be it

Resolved, That it is with great regret that this society consents to the withdrawal of Mr. John J. Nissley, treasurer, who has been an active member of this society for thirty years. His association with us has been most pleasant and his judgment of great benefit. We, the society, in parting with him in his official capacity, tender him our best wishes for his future welfare, and most hearty thanks for past services on behalf of the society. Be it further

Resolved, That a copy of this resolution be sent to Mr. Nissley, and a copy entered on the minutes.

(Signed.)

C. H. BERGNER,
JOHN McDOWELL,
J. SCHALL WILHELM.

Secretary Wilhelm also said it was his sad duty to report the death of two of the society's most active and honored members—the late D. W. Seiler, secretary, and Hon. John B. Rutherford (for many years treasurer of this society), and asked that a committee consisting of Chas. H. Bergner and Col. H. C. Demming be appointed to draft suitable resolutions, one of which to be sent to the family of each, and the other recorded upon the minutes of the society.

Seconded and agreed to.

The committee made the following report, which was accepted:

Whereas, The announcement of the death of D. W. Seiler (who for many years has served as the Secretary of the Pennsylvania State Agricultural Society), has been made to said society in annual meeting assembled; and

Whereas, This association is desirous of expressing its appreciation of the manner in which Mr. Seiler performed his official duties, and of the high esteem in which he was held by his fellow members; therefore, be it

Resolved, That in the death of D. W. Seiler the Pennsylvania State Agricultural Society has lost an active and consistent member, and an accommodating and faithful official, and a gentleman who was always ready to aid in any effort to accomplish the objects of the society; and further

Resolved, That this society hereby tenders its condolence to the family of Mr. Seiler, and directs that a copy of these resolutions be sent to the family, and also entered upon the minutes of the society.

(Signed.)

C. H. BERGNER,
Col. H. C. DEMMING.

Whereas, The Pennsylvania State Agricultural Society, at its annual meeting assembled, has heard with profound regret of the death of John B. Rutherford, who, for many years, was an active member of the Pennsylvania State Agricultural Society, and for a considerable period of his membership served as treasurer thereof; and

Whereas, It is proper that the sentiment of this association be officially expressed; therefore, be it

Resolved, That in the death of John B. Rutherford this association has lost a valuable member, an upright official, and one who, in all his associations with the work and members of the society, has displayed the greatest integrity and the kindest disposition; and it is further

Resolved, That the condolence of this association be tendered to the family of the deceased member, and that a copy of these resolutions be presented to the family, and also entered upon the minutes of the society.

(Signed.)

C. H. BERGNER,
Col. H. C. DEMMING.

Vice President Bergner offered the following resolution:

Whereas, The two editions of the State report, entitled "The Birds of Pennsylvania," have failed to supply the great demand on the part of agriculturists and horticulturists for this kind of literature; and

Whereas, In view of the offering of bounties for the killing of various wild animals, many of which are highly serviceable to the farmer and fruit grower, there has arisen, we believe, a necessity for the State to issue, for gratuitous distribution, authentic histories of the birds and mammals of our Commonwealth; therefore, be it

Resolved, That we earnestly request the members of the Legislature, now in session, to pass a bill providing for a revised history of the birds and mammals of Pennsylvania, and that said history be prepared under the direction of the Ornithologist of the State Board of Agriculture.

Which was seconded by Mr. Wilhelm and agreed to.

Mr. Rutherford called attention to the clause in the constitution and by-laws, making it incumbent upon the executive committee to meet quarterly; that, in view of the depleted treasury, he advise that these meetings, owing to their expense, be dispensed with for the present year; which was agreed to.

At this point Mr. McDowell was escorted to the chair, when he addressed the society as follows:

"It is with feelings of deep anxiety, filled with a sincere desire to see the Pennsylvania State Agricultural Society placed upon a strong

basis, that I address you from the position which you, by your votes, have honored me. This desire can only be reached by the active co-operation of its friends and well wishers.

"To insure success we must use economy in its management, and we need help from the State. These objects are within our reach. The Legislature ought to appropriate a sufficient sum to place our State society on a par with other State societies. The great work the society has accomplished is proof of its value. Its fairs are always sought by exhibitors of stock; also by those who represent implements and fine arts. The products of the factories, the looms, the mills and the mines, of the fields and the vegetables is not surpassed by any other State. Therefore it is the Pennsylvania State Society that has been sought as a medium or place to exhibit stock and other products of the State. It is largely through the State fairs that the traffic or commerce of the State has increased; hence the rapid development of its resources.

"When our society was financially wrecked, it rose and asserted itself, and by its joint fairs at York, Bethlehem and Scranton, the thousands that attended those fairs testified to its name and its influence in drawing exhibits, and themselves as crowds of visitors. This influence it will hold independent of State aid, but, with a suitable appropriation, it will rise to form the agricultural keystone block of the arch of our great State.

"This will be an eventful year. An opportunity will be given to all people to visit the great Columbian Exposition at Chicago, but that is no reason why our State should not, at this remote distance, hold a fair this year.

"In conclusion, gentlemen, I thank you for the honor you have conferred upon me, for the sixth consecutive term, in electing me as your president. I cheerfully accept the office, and will endeavor to discharge the duties thereof with fidelity, asking your cordial support."

On motion, the executive committee this day elected, was requested to meet at the society's office, at 2 o'clock, p. m., to-day.

There being no further business, the society adjourned.

J. SCHALL WILHELM,
Secretary.

PROCEEDINGS OF THE EXECUTIVE COMMITTEE.

Harrisburg, Pa., January 18, 1893.

The executive committee, this day elected, met in regular session at 2 o'clock, p. m., President McDowell in the chair.

Present: McDowell, Branson, Rutherford, Correll, Stitzel, Hiester, Young and Wilhelm. J. C. Overmiller, stenographer to the secretary, and J. Paul Nissley were also present.

On motion of Hon. David H. Branson, Mr. McDowell was unanimously elected chairman of the executive committee.

dent be authorized to appoint a committee of arrangements, to consist of seven members of the executive committee; that President McDowell should be a member, and be president of said committee of arrangements. That the duties of said committee of arrangements should be to take entire charge of the affairs of the society for the year, and that all the powers of the executive committee should be vested in them; which was seconded and unanimously agreed to.

Whereupon Mr. McDowell, in conformity with the above resolution, appointed the following Committee of Arrangements for 1893, viz:

John McDowell, president; D. H. Branson, W. F. Rutherford, C. H. Bergner, T. A. Correll, Chas. E. Voorhees and J. Schall Wilhelm.

Mr. McDowell announced that he had received the following letter from Col. H. C. Demming:

Henry C. Demming,

No. 17 North Third Street,

Harrisburg, Pa., January 17, 1893.

Hon. John McDowell, President Pennsylvania State Agricultural Society, Harrisburg, Pa.:

Dear Sir: Permit me to tender my resignation as stenographer of the Pennsylvania State Agricultural Society, and to request that I be not re-elected.

Frequent absence from the State during the year in connection with my mining and farming operations necessitated this course.

I shall be glad to co-operate with the society, or its members, at any time.

With my kindest personal regards, I remain,

Faithfully yours,

(Signed.)

H. C. DEMMING.

Mr. McDowell announced that he accepted the resignation with regrets, and that he had directed the secretary to write Col. Demming the following letter:

Harrisburg, January 21, 1893.

Col. H. C. Demming, Harrisburg, Pa.:

Dear Sir: Your favor of the 17th inst., addressed to Hon. John McDowell, president, has been received.

The president directs me to acknowledge its receipt, and say that your letter was received too late to prevent your election as stenographer of this society; that he notes that your mining and farming operations during the year will prevent your serving on the board, and that he accepts your resignation with regrets, with thanks for your offer to co-operate with the society, or its members, at any time.

The president directs me to say that the society and its members will be glad to avail themselves of this latter privilege.

Very truly yours,

(Signed.)

J. SCHALL WILHELM,

Secretary.

Mr. McDowell then announced that he had appointed Mr. J. C. Overmiller stenographer, vice Col. H. C. Demming, resigned.

Mr. Wilhelm called attention to the importance of early deciding

on time and location for holding this year's exhibition, and asked that a committee on location be appointed, to whom the matter be referred. Whereupon the president appointed as Committee on Location, C. H. Bergner, T. A. Correll, W. F. Rutherford and J. Schall Wilhelm.

Secretary Wilhelm then presented letters from Hon. A. B. Longaker, of Easton, Pa., and S. C. Baker, of Altoona, Pa., which were read as follows, and referred to the committee on location.

Easton, Pa., December 28, 1892.

J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.:

My Dear Sir: I have a few suggestions to make as regards the future of the society.

1st. If a fair is proposed for the coming year, it is important to select the place within the next three months, because if a locality is selected in which sales of beer can be advantageously made, a license should be procured. Most of the courts have fixed terms in the early part of the year to act upon applications.

2d. Some three months ought to intervene between the selection of a place and the holding of the fair.

3d. I believe the society can be maintained if some one is selected who will be willing to devote his time to make it a success.

4th. If agreeable to the managing board, I am willing to accept such position, and have my compensation dependent upon the proceeds realized; provided that a liberal sum is to be taken from the proceeds to pay necessary expenses, something in amount equal to what was paid last year.

Wishing you a happy New Year,

I am, yours truly,

(Signed.)

A. B. LONGAKER.

Altoona, Pa., December 30, 1893.

Secretary State Agricultural Society, Harrisburg, Pa.:

Dear Sir: With the completion of a street railway to our driving park, we purpose making it an agricultural exhibition grounds as well as of speed horses.

As we have the attendance that will justify first-class accommodations, purpose having such improvements as will accommodate a State fair, should we be so fortunate as to get it. Whether we get it or not, will offer such inducements as will bring the best here.

Kindly advise what is your usual requirements, that we may fill them at once.

Yours truly,

(Signed.)

S. C. BAKER.

The subject of holding the fair for the coming year was discussed at length by Messrs. Correll, Stitzel, McDowell, Young, Branson and Hiester, but no definite action was had.

Mr. Wilhelm called attention to the incompetent manner in which the advertising of this society has been done, and thought we should have a press representative to assist and take charge of this impor-

tant matter. After discussion, on motion, President McDowell appointed Thomas M. Jones, of Harrisburg, a press representative of this society.

The subject of an ornithologist and a mammalogist was taken up and discussed. On motion, Dr. B. H. Warren, of West Chester, Chester county, Pa., was appointed as ornithologist and mammalogist of this society.

On motion of Mr. Wilhelm, seconded by Mr. Rutherford, a committee on finance and re-organization was appointed to carry out the views expressed by Dr. Correll as to the funding of the debt of the society. The president appointed as this committee Messrs. Wilhelm, Correll and Rutherford.

There being no further business, on motion adjourned.

J. SCHALL WILHELM,
Secretary.

In the constitution and by-laws governing the Pennsylvania State Agricultural Society, under the head of "Corresponding Secretary," appears the following:

"The duty of this officer shall be to invite a correspondence with all persons interested in agriculture, whether in the State of Pennsylvania or elsewhere, but especially with our consuls in foreign countries, that new seeds, vegetables or live stock may be introduced, and their fitness for cultivation and propagation in our climate be tested. At each stated meeting of the society he shall read his correspondence, which shall, either the whole, or such parts as may be selected by the society, form a portion of the transactions. He shall also correspond with the president or other officers of each State society in the United States, at least twice in the year, for the purpose of combined and mutual action, and to be informed of the results and progress of each other's efforts; also, to invite mechanics to forward models or implements for examination or trial."

In conformity with the article cited above, I addressed the following letter to each of our consuls in foreign countries (see page 34), and submit the correspondence thus far received from them. I also addressed the following to the president of each State Agricultural Society in the United States (see page 55), and submit the correspondence thus far had with them.

This correspondence has had a tendency to attract or draw greater attention to the Pennsylvania State Agricultural Society from foreign points, than has ever been known in the history of the society, and, if continued, can have but one tendency, that of much good, and of bringing the Pennsylvania State Agricultural Society of this great Commonwealth, and its work, to the front rank, where it belongs, in the development of this great industry, agriculture.

In the article governing the office of corresponding Secretary cited above, it will be seen that this correspondence should be conducted "at least twice in the year." Owing to the magnitude of it, and the delay in getting the answers, it should be changed to read but once during the year.

(Copy.)

Harrisburg, Pa., February 21, 1893.

U. S. Consul:

Dear Sir: On the 18th of January, 1893, I was elected Secretary of the Pennsylvania State Agricultural Society. Reading the list of duties prescribed for this officer, I find the following:

"That he shall invite a correspondence with all persons interested in agriculture, whether in the State of Pennsylvania or elsewhere, but especially with our consuls in foreign countries, that new seeds, vegetables or live stock may be introduced, and their fitness for cultivation and propagation in our climate be tested. At each stated meeting of the society he shall read his correspondence, which shall, either the whole, or such parts as the society may select, form a part of the transactions."

Will you oblige me by sending to my address at Harrisburg, Pa., U. S. A., such seeds or vegetables that, in your judgment, could be propagated with profit in the State of Pennsylvania. Also, be kind enough to advise me of the different breeds of live stock used for agricultural purposes in your country, the average price for the same, and whether they would be adapted to a climate such as we have in Pennsylvania.

Also, be kind enough to inform me of the condition of this great industry—"agriculture"—in the country in which you are situated, as well as any new departures made in this direction.

Any information you may give me will be gratefully received, not only by the Pennsylvania State Agricultural Society, but by

Very truly yours,

(Signed.)

J. SCHALL WILHELM,
Secretary.

(Copy.)

Consulate General of the United States,
Markgrafen Strasse 49,
Berlin, March 10, 1893.

J. Schall Wilhelm, Esq., Secretary, &c., &c., Harrisburg.

Dear Sir: In reply to your communication of February 21, 1893, I beg to inform you that it will give me pleasure to send you specimens of any new seeds or plants which I may see, and think may be propagated with advantage in the State of Pennsylvania.

It is proper that I should remind you that consular officers are required to communicate to the Department of State at Washington any useful and interesting information relating to agriculture which may be within their reach.

Such as is deemed of general interest is usually given publicity by the Department, either through the medium of the public press or in the consular reports. Upon application to the Chief of the Consular Bureau, at Washington, you would, doubtless, be sent all the consular reports when published.

It has occurred to me that if you subscribe for one of the leading agricultural journals in each of the principal agricultural countries of

the world, you would obtain the most reliable information in the respect of everything of importance relating to agriculture.

Yours truly,

W. H. EDWARDS,
Consul General.

(Copy.)

John S. Durham,
Legation of the United States,
Port Au Prince, Haiti, March 10, 1893.

Honorable J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa., U. S. A.

Dear Sir: I regret exceedingly that there is nothing in this country to contribute to the inquiries which you are making in behalf of your society. There is scarcely anything cultivated here. The vegetables ordinarily found in tropical markets are to be found here in small quantities, and in better condition than those of some others of the islands of the West Indies. There is absolutely nothing, however, that would be useful to you in your inquiries.

As to the condition of agriculture as an industry, I cannot better indicate the state of things than by saying that, after eighteen months in the country, traveling much in the interior, I have yet to see a plow.

Regretting that I cannot serve you, I am

Very respectfully yours,

(Signed.)

JOHN S. DURHAM,
Minister Resident and Consul General.

(Copy.)

United States Consulate,
Barcelona, Spain, March 12, 1893.

J. Schall Wilhelm, Esq., Secretary Pennsylvania State Agricultural Society, Telegram Building, Harrisburg, Pa.

Dear Sir: The vegetables and trees in this part of Spain are inferior to those in your State, and the only live stock used here for agricultural purposes that are superior to those of their kind that we have in the United States, are the jackasses, which are, undoubtedly, the best in the world, and which are exported from here to the United States in quite large numbers, each costing, on the average, \$175.00. The climate of Pennsylvania, however, would be rather too severe for them, I think.

Spain cannot teach any civilized country in regard to agriculture, and she shows but little willingness to be taught by them. Nearly fifty per cent. of her land is uncultivated, and the remainder is insulted with antique implements.

I have the honor to be, sir,

Your obedient servant,

(Signed.)

HERBERT W. BOWEN,
United States Consul.

(Copy.)

Consul General of the United States of America,
Paris, March 14, 1893.

J. Schall Wilhelm, Esq., Secretary Pennsylvania State Agricultural
Society, Harrisburg, Pa.

Sir: In receipt of your letter of the 21st ultimo. I have to inform you that statistical information of the character referred to can only be furnished when called for by the Department of State. To compile the same would involve much labor, and it can be procured only from the French Minister of Agriculture, through the United States Legation.

Respectfully yours,

(Signed.)

ADAM E. KING,
Consul General.

(Copy.)

United States Department of Agriculture,
Office United States Consulate General,
12 St. Helen's Place, London, E. C., 14th March, 1893.

J. Schall Wilhelm, Esq., Secretary Pennsylvania State Agricultural
Society, Harrisburg, Pa.

Dear Sir: Your letter of February 21st has been handed me by Consul General New, with request that I reply.

Regarding seeds, &c., suitable for your State, I think you would do better to correspond with the Secretary of Agriculture, at Washington, as we have no seeds here for distribution.

As to live stock used here, the English shire horse is almost universally used for draft purposes. In some parts the Suffolk Punch is bred, and in Scotland the Clydesdale is chiefly raised. The shire is probably used much more than any other. Shire stallions sell according to quality, &c., at from \$500 to \$4,000, and some even higher than that. The great industry of agriculture is in very bad shape here. The farmers complain of bad crops, low prices and ruinous taxes. Eighty-six per cent. of the farms are occupied by tenants, and only fourteen per cent. by the owners. With respect, I remain

Yours truly,

(Signed.)

M. C. RING,
303 High Holborn, W. C., London, Eng.

(Copy.)

United States Consulate,
Dundee, 15th March, 1893

J. Schall Wilhelm, Esq., Secretary of the Pennsylvania State Agricultural
Society, Harrisburg, Pa.

Dear Sir: I have to acknowledge the receipt of your letter of the 22d ultimo, in which, among other things, you required me to send to you such seeds and vegetables as can be grown in Pennsylvania, information concerning live stock used for farm purposes, prices, and so on, for the use of your society. In reply, I am constrained to say that consuls are prohibited from supplying such information at the

instance of individual applicants, except by the direction of the Department of State at Washington. The reason for the rule will suggest itself on reflection.

I am, dear sir,

Very truly yours,

(Signed.)

A. B. WOOD.

(Copy.)

United States Consulate,
Maracaibo, March 16, 1893.

Mr. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: I am in receipt of your favor of February 22d, and will be happy to further your wishes in any way in my power. As the climate of this section is, however, ultra-tropical, it is doubtful whether any vegetable products indigeneous to the soil could be grown so far north as Pennsylvania, and the plants which are common to both localities, such as corn and various vegetables, develop infinitely better in the temperate zones.

It may be stated, indeed, as a general rule, that all vegetable productions, grown both in the tropic and temperate zones, give better results and are superior in quality in the latter. In the matter of live stock, such as horses, cattle, &c., Venezuela is far behind the United States, and in very few cases have efforts been made to improve the breeds. Of goats and asses, however, there is no end; the latter, indeed, being styled the "Venezulean railway service," as they are the mainstay of the country for purposes of transportation and travel.

Should I, however, see an opportunity of being of service to your society, I will not fail to communicate.

Very truly yours,

(Signed.)

E. H. PLUMACHER,
United States Consul.

United States Consulate General,
St. Petersburg, March 18, 1893.

J Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: In reply to yours October 21, 1893, I have to say that the Russian government is now publishing an elaborate work entitled "The Industries of Russia," in three large octavo volumes, and of which I am the editor of the English translation. The first volume is entitled the "Agriculture and Farming in Russia." This work will be ready in July, and will be distributed on application to the various boards of trade and agricultural societies, and will give a full account of the agricultural and other industries of Russia.

If you will address your application to Count Rostootson, Imperial Russian Commissioner, representing the Department of Agriculture at the World's Fair, you will receive every attention.

Very respectfully,

(Signed.)

J. M. CRAWFORD.

(Copy.)

Consulate of the United States of America,
Callao, Peru, March 20, 1893.

J. Schall Wilhelm, Esq., Secretary Pennsylvania State Agricultural Society, Telegram Building, Harrisburg, Pa.

Dear Sir: Yours of February 21st reached me March 18th.

In reply I have to say:

1st. That I have no money for the purchase of seeds of any kind to be sent to anyone. A short time since I was directed by the Department of State to purchase some cotton seed, and send to the Agricultural Department, but provision was made for re-imbursement. But I know of no seeds that would be useful in your State. The fruits and vegetables in this country, of the class that are raised in the State I come from, Illinois, and in Pennsylvania, are very inferior, and improvement is needed by importations of seeds from the United States rather than from here to the States. Apples, peaches, pears, tomatoes, most of the potatoes, melons, squashes, beans, beets, cabbage and the like, are very inferior to our best. There are some very fine potatoes raised on the plateaus, three to five thousand feet up, and even higher, but I think the soil and peculiar climate at that altitude accounts for the superior quality. I have had many interviews on the subject, and it is questionable whether seed potatoes from Peru would prove a success at home. At any rate, we have, in the Peach Blow, and what is known in Illinois as the Baltimore Blue, a potato equal to the best here. There is a potato here known as "comote," and classed wrongly, I think, as a sweet potato, which is very peculiar. The meat of this potato is yellow and very mealy, but it has not the shape of the sweet potato proper (which is also plentiful here), but rather of the common potato of the States known as the Irish potato. The "comote" inclines to sweetness, but is by no means sweet like our potato called the sweet potato. The "comote" is the choice variety here, and commands a higher price than any other. Taken all in all, I should say that, in the way of fruits and vegetables, there is nothing here desirable that can be raised in our States. Some of the fruits, such as the "chirimoyo" and the "palta," are desirable, but it has been demonstrated, I am told, that these cannot be raised in our climate. A gentleman in California, however, has written to get some cuttings and seeds of the "chirimoyo" to try in the climate about Los Angeles.

As to live stock, I can only say that the cattle of this country are generally a scrubby lot. Importations are being made from Europe, with a view to improving the breeds, but at the slow pace at which they are going in this direction, it will take an age to make noticeable improvement.

Where they receive ten head they should get a hundred. The same may be said of the horses and mules. There are some good horses, but they are the exception.

Fat cattle sell for about seven cents per pound gross. Horses run all the way from sixty soles to five hundred soles each. The high-priced horses are imported. It costs to keep a horse (by which I mean to have him fed and taken care of at a livery stable), fifteen soles per month. The value of a sole is about fifty-eight cents gold.

If a Pennsylvania farmer were to visit one of the haciendas in this



FEDERAL. (6741.)

Property of WILLIAM STEEL, "Hannastown Farm," Freensburg, Pa. Winner First Prize in Aged Clydesdale Class
at State Fair, at Indiana, Pa., 1893.

country, or farms, he would find the system of farming, in almost every particular, different from that at home, and so much so, on account of the changed condition, that he would find comparison difficult to make. In the first place, all cultivation is by irrigation, and the "acequias," or water ditches, are, in many cases, the same that were used by the Incas two hundred and three hundred years ago. In all the valleys this side of the Andes, sugar-cane, rice and cotton are the principal products. Cane is planted about every seven years, the new crop sprouting from the roots immediately after the ripened crop is cut. In the vicinity of Callao the fields are much given to grazing. The miserable poor and half-starved cattle from the ports above and below, are brought here on the steamers, and turned in on the alfalfa when it is about waist high. From this they are often changed to a field of corn, which is sowed broadcast or drilled (generally the latter); and when the corn is as high as a man's head, the cattle are turned in to eat it down. Corn is raised all the year round. There is not a month in the year in which I cannot buy roasting ears in the market. In a recent ride up the valley of the Rimac, I saw fields of corn ready to husk, and alongside of these fields was corn in the milk, and further on waist high, while others were only a few inches high.

Agriculture is declining on account of the scarcity of labor. The Chinese laborers—the best labor in the country for the agriculturist—is disappearing. Every ship that goes from here to China, and there is one about every two months, carries a load of Chinamen, who came here long years ago as coolies, or who are descended from those who came in that capacity. Many of them carry back to China families, having intermarried with the Indian population of Peru.

I am reliably informed by masters of vessels who carry these Chinese back to the land from which they came, that, notwithstanding appearances, which certainly do not indicate financial ease, there are few, if any, of them who carry to China less than one thousand dollars gold, each, and yet they have saved this from wages which the workingman in our country would spurn as the wages of starvation. So scarce is labor for the farm that the Minister of State, in whose hands is placed affairs pertaining to agriculture, mentioned the fact in his report last year, and urged upon congress some action looking to the inducement of immigration from European countries to supply the place of the departing Chinamen. Farm wages run from twenty to sixty cents a day. I think the average will be nearer thirty cents than forty, and the Peruvian silver dollar is worth fifty-eight cents in American money.

No oats raised in this country. Wheat is raised over the Andes, and a fine quality of wheat, too; but the cost of bringing it to the railroad is so great, that Peru supplies herself with wheat from Chili, for bread supplies along the coast. The best hogs raised in Peru are the Berkshire, and they are fine specimens, too.

I refer you for further facts to my report, forwarded to the Department of Agriculture and State, at Washington, which are probably printed by this time, or will be soon.

Very respectfully,

(Signed.)

A. J. DAUGHERTY,
United States Consul.

(Copy.)

United States Consulate General,
Honolulu, H. I., March 22d, 1893.

J. Schall Wilhelm, Esq., Harrisburg, Pa., U. S. A.

Sir: I am in receipt of your favor of February last, in which you seek various facts and statistics concerning matters in this country which the Consulate General has no time to make reply in detail. I therefore have to refer you to a very careful and reliable statement and summing up of Hawaiian affairs, which has recently been published in the March number of the "North American," and which was originally read before the Social Science meeting in this city, by the author, Hon. L. M. Thurston. I will also refer you to Phrum's almanac for 1893, published by Thomas G. Phrum, of this city, which can be had in San Francisco, Cal., of the San Francisco News Company, price, 70 cents. With this source of information you will have reliable statistics, which this office cannot give for want of clerical force, as well as time to prepare.

A. C. McClurg & Co., Chicago, are also agents for Phrum.

Very respectfully,

H. W. SEVERANCE,
United States Consulate General.

Hon. H. W. Severance sends us a copy of the "Daily Pacific Commercial Advertiser," of March 15, 1893, published at Honolulu, Hawaiian Islands, from which we quote the following:

"The Hawaiian Commissioners, during their stay at Washington, during the pending of the annexation question before the Congress of the United States, had received so many letters of inquiry, that it was found necessary to have it blank printed. Appended will be found an abstract of it," which we re-publish as of interest to Pennsylvania farmers, in connection with the subject of agriculture on the Hawaiian Islands:

"CIRCULAR OF INFORMATION.

"Washington, D. C., _____, 1893.

"Mr. _____

"Your communication, asking for information concerning the islands has been duly received. We have been in receipt of so many similar inquiries, that it is impossible to make individual reply to all of them. This short circular has, therefore, been drawn up, setting forth, briefly, what the situation is in the islands, and replying in gross to the different questions asked.

"The last year or two in the Hawaiian Islands have been years of great business depression, the McKinley bill having seriously crippled all industries there. The result has been to throw many people out of employment. Such conditions still exist. If annexation to the United States takes place, undoubtedly there will be a business revi-

val and a great impetus given to every line of industry. Such conditions will not come about immediately, however, and we should not advise any one to go to the islands for the immediate present, who has not sufficient money to maintain himself for some time, without regard to what employment he may obtain.

"To persons having some capital to invest, we can confidentially recommend the islands as a sound field for investment, and would recommend their investigation of the situation there. The island formation is almost entirely volcanic, and there are no minerals except iron, of which there are some deposits suitable for manufacture into mineral paint. The resources of the islands are agricultural. They are, as yet, practically undeveloped, excepting in the cultivation of sugar and rice. The field is yet untouched for the small farmer. A great future is in store for coffee, oranges, banannas and other tropical fruits. There is great promise in tobacco. The islands also produce many valuable fibres. The forests contain much fine cabinet wood; nothing of any account has yet been done with them. An opportunity will be offered to capitalists to create a land transportation system by way of railroads. New conditions of soil and climate will require new methods and new appliances, or a skillful adaptation of old methods to new conditions.

"Hawaii can and will eventually support a population of 1,000,000, in place of its present 100,000. The climate is mild and healthful,—never excessively hot nor cold—90 degrees being the highest, and 50 the lowest range at sea level. The average temperature is 76 degrees, and the average daily variation in temperature from 6 to 12 degrees, making it one of the best in the world for all lung troubles. Different altitudes will afford considerable range. Hawaii is destined to be one of the world's great sanitariums, and thither will flock thousands in search of health and rest. Already the tide sets that way."

(Copy.)

United States Consulate,
Valparaiso, Chile, April 8th, 1893.

J. Schall Wilhelm, Esq., Harrisburg, Pa.

Dear Sir: I am in receipt of yours of February 21st, asking me to send such seeds or vegetables that, in my judgment, could be propagated with profit in the State of Pennsylvania; also, to advise you of the different breeds of live stock used for agricultural purposes in this country, the average price for the same, and whether they would be adapted to a climate such as you have in Pennsylvania.

I beg to state, in reply, that I have been in Chile only since December 10th, last; that my successor has been appointed, and will, no doubt, arrive in a few weeks to relieve me.

Since my arrival I have been so busy with other matters, in connection with my official duties, that I have had no time to inform myself on the subject of agricultural pursuits in Chile.

I will, however, try to furnish you the information desired before my departure for the States.

I am, sir,

Your obedient servant,

(Signed.)

CORVIS M. BARRE,
United States Consul.

(Copy.)

Legation of the United States of America,
Monrovia, Liberia, April 10, 1893.

J. Schall Wilhelm, Esq., Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Sir: In reply to your communication dated February 21st., I would respectfully state:

1st. Agriculture is in a primitive condition in this country, nothing being raised except a few articles necessary for food, and coffee. Rice, cassada and sweet potatoes are the principal articles for food.

2d. A few cattle, sheep, goats and hogs are raised, but you have a much better breed of each in Pennsylvania. There are no horses here.

I shall probably leave here about the latter part of July to return to America, and if I can serve you by giving you a personal account of the agriculture carried on here, let me know, and I may be able to stop over a few hours at your city for this purpose.

I am, sir,

Very truly yours,

(Signed.)

WILLIAM D. McCOY,

United States Minister Resident and Consul General.

Direct, care of the Department of State, Washington, D. C.

(Copy.)

Consulate General,
United States of America,
Constantinople, May 17th, 1893.

Hon. J. Schall Wilhelm, Harrisburg, Pa.

Dear Sir: With reference to yours of February 22d, 1893, in which you ask me to inform you of the condition of agriculture in this country, as well as any new departures made in this direction, I take great pleasure in giving to you, and, through you, to the Pennsylvania State Agricultural Society, such facts and information which I have been able to obtain, after studying this great industry in this country. I find that cultivation is very superficial. Land is generally allowed to lie fallow every second year; but with occupants of large estates, the ordinary rule for rich lands is two wheat crops and one of oats, then fallow one or more years. There is but little manuring of land here. A good deal of the ground is so rich that a general bad harvest is of rare occurrence on account of poor soil. This year, so far as reports go, the wheat crop in Asia Minor is good, while in European Turkey the reports are that the wheat crop is very poor. The mode of cultivation here is very primitive. The plow used is very rude, being antediluvian, consisting of little more than a sharpened stick, having one handle only, and roughly shod with iron. The scythe, the flail, the sickle, the antediluvian plow and the seed bag has not yet given place by the mower, the separator, the binder, the chilled plow, the drill and the planter. Very little labor-saving machinery of any kind is used. In some parts of the empire, some large estate owners attempted the introduction of agricultural implements from Europe, some years ago, but they met with very little success, in some instances being a total

failure. The most of the farmers scatter their grain over the stubble and then plow it in. If they harrow it in it is done by dragging a log crosswise over the plowed ground. I think that the improved American farm implements, neither too expensive nor too complicated, might find a limited market in portions of the Empire. Their superiority over the primitive tools of the country might soon become recognized, and eventually open up the field for a remunerative trade to the United States. Threshing is done in the most antique manner imaginable. The instrument principally used for this purpose consists of two pieces of wood, curved at one end, then fastened together, and then studded with a number of flints. This is attached, at the curved end, to a team, usually oxen or buffalo, sometimes horses, and the driver stands on the sledge and drives the team over the grain until the grain is tramped out. The grain is winnowed by being thrown up into the air with wooden shovels, the breeze carrying away the chaff. Sometimes just the horses and oxen are driven over the grain, and the women and children will sit on the ground and help in the operation by beating the grain with sticks. The principal cereals grown here are the wheat, barley, rye, rice, durrah or maize, and sesaine. From sesaine an oil of a superior quality is made.

Spring and winter wheat is raised. Other crops are raised, such as beans, peas, potatoes, lintils and tobacco. Figs, olives, grapes, oranges and lemons are abundant, and of fine quality. Camels, donkeys, oxen, buffaloes and even women are used in plowing. Horses are very rarely used. The cattle in Turkey are usually small, but hardy and very serviceable. Little attention has hitherto been paid toward improving the breed of stock of any kind. Sheep are small, and their wool of an inferior quality. There is a breed in Asiatic Turkey, called the Karamania, or broad tail breed. Their fat is much used by the natives for cookery, and their milk is made into cheese. Sheep raising is carried on, both in European and Asiatic Turkey rather extensively. Great quantities of wool would be exported from this and other ports in the Empire to the United States this season, if it was not for the quarantine laws of the United States. A great number of goats are kept in the Empire. Their milk is used for table use and for making cheese. The Angora goats are much prized for their fleece. Their exportation is absolutely prohibited by the Sublime Porte. Usually, however, it is not profitable to try to introduce them elsewhere, for they do not seem to thrive away from their native mountains. I hope that this has not been too lengthy a report. Should you, or your society, require any information on any other matter, I will be pleased to give it to you. While I have the honor of remaining here, and how long that will be I am not able to say, I will always be ready and willing to do what I can to promote commercial intercourse between this country and the United States. Too many of our consuls, I am sorry to say, put in more time in having a good time than they do in the discharge of their duty, in trying to enlarge our commerce. Remember me to the officers of the society of which you are secretary. I beg to remain,

Yours truly,

(Signed.)

W. B. HESS,

United States Consul General,

P. S.—Please hand my cards to the president of your society and other members with compliments.

(Copy.)

Consulate General of the United States,
Seoul, Korea, June 10, 1893.

J. Schall Wilhelm, Esq., Secretary Pennsylvania State Agricultural
Society, Harrisburg, Pa.

Dear Sir: I beg to acknowledge the receipt of your letter of the 21st February, requesting me to send you information regarding the live stock of this country, its agricultural products and resources, and regret that I have been unable to do so. My health has compelled me to apply for relief, and I expect to leave Korea very shortly. I will hand your letter to my successor.

I am, dear sir,

Yours faithfully,

(Signed.)

AUGUSTINE HEARD,

(Copy.)

Consulate of the United States of America,
Asuncion, Paraguay.

J. Schall Wilhelm, Esq., Harrisburg, Pa.

Dear Sir: In answer to your letter of February 21, I will say that the same vegetables raised in Pennsylvania are grown here, with the exception of the "mariclioca" root, which is the staple article of food in South America. It takes the place of bread, and is very easily grown, necessitating no care whatever, it being of such strong growth that it kills all weeds which grow with it. It is planted all the year, but will only grow in a very warm country. The root is made into flour, or, by boiling, eaten in its natural state. When well cooked, by experience, it has the flavor of the best variety of walnut.

The live stock is a medium class of animals, generally imported from Brazil or the Argentine Republic. There are no good classes of live stock.

In regard to agriculture, it can be answered in a very few words. The people will not work, and, therefore, very little of Paraguay is under cultivation. Hoping this will prove satisfactory, if not, command my services further, I am,

Very respectfully,

(Signed.)

EDMUND SHAW,
Consul.

(Copy.)

Harrisburg, Pa., February 22, 1893.

President State Agricultural Society.

Dear Sir: On the 18th of January, 1893, I was elected secretary of the Pennsylvania State Agricultural Society.

I find, in the list of duties prescribed for this officer in the constitution and by-laws, that "he shall correspond with the presidents or other officers of every State society in the United States, at least twice in the year, for the purpose of combined and mutual action, and to be informed of the results of each other's efforts."

I refer with much pleasure to the correspondence had with your society during the last year.

1st. Have you decided on the date for this year's fair or exposition?

2d. Will you kindly send me one of your premium lists for this year?

3d. Have you decided on any new attractive features for this year's exhibition?

4th. Will you oblige me by sending to my address, copy of your State Report of Agriculture? Our report will be mailed you in a few days; soon as received from the State Printer.

5th. What progress is being made in your State in the development of this great industry—agriculture?

We have a bill now pending in our State Legislature, with very encouraging prospects of passing, appropriating \$100,000 for the purchase of a permanent home for holding our annual exhibitions.

We have also introduced the following resolution in the Legislature:

"Whereas, A knowledge of the elements of agriculture on the part of the teachers of our rural public schools would enable them to solve many questions on the subject, propounded by scholars and their parents, and thus tend to remove many errors which retard the progress of our art; therefore,

"Resolved, That the State and county superintendents of our common schools, and the officers of the State Normal Schools be, and they are hereby, requested to make provision whereby familiar lectures on the elementary principles of agriculture shall be given to both male and female students of the normal schools, in order that they may become fitted to advise pupils and people of the rural neighborhoods in which they may locate, of the nature and use of germicides, and the reasons for pursuing improved methods of husbandry."

We continue, through our State Board of Agriculture, to hold farmers' institutes throughout the State, where farm subjects are discussed, and which have been attended with gratifying results.

To-day a new building for engineering purposes will be dedicated at our State farm school, at Bellefonte.

We have also introduced in our Legislature, a bill to prohibit the sale of oleomargarine butter, and think it will pass.

Be pleased to hear from you.

Yours very truly,
(Signed.) J. SCHALL WILHELM,
Secretary.

(Copy.)

New York State Agricultural Society,
Albany, N. Y., February 25, 1893.

Mr. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: Your favor of the 22d inst., received, and contents noted. I am pleased to learn that the agricultural interests of your State are in such a flourishing condition, and that the prospects of material aid from your Legislature for your society is so good.

A bill has been introduced in our legislature to establish a bureau of agriculture, under the direction of a commissioner. We hope that

the legislature this year will assist our society to erect additional buildings on our permanent grounds at Syracuse. Over one hundred farmers' institutes have been held this year, under the direction of this society, with most gratifying results. Resolutions have been adopted at many of the institutes, recommending the introduction of the study of agriculture, in its various phases, in our common schools.

At our annual meeting, January 18th, a resolution was unanimously adopted, congratulating the Secretary of Agriculture, Hon. J. M. Rusk, on the extirpation of pleuro pneumonia, and testifying to the good work of the Bureau of Animal Industry in driving this disease from our country. A resolution was also passed at this meeting, asking the Legislature to appoint a committee to investigate the practice of dehorning cattle, for the purpose of determining whether the practice is humane and justifiable, and to report to the Legislature the result of the investigation, with the draft of a bill in accordance therewith, either prohibiting, specifically, such practice, or specifically authorizing it.

According to the constitution of this society, an annual state fair shall be held, commencing on the second Thursday in September, and continuing until the succeeding Thursday. Our premium lists will not be issued until after the next meeting of the board, in April. Attractions, &c., will then be decided on.

I am sorry to say that the copies of our last annual report were burned in the fire which destroyed the State printer's establishment in this city. I will send you a copy as soon as the new edition is published, and shall be pleased to receive the report of your society which you kindly promised me.

Yours truly,
(Signed.) G. HOWARD DAVISON,
Secretary.

Officers elected for 1893: Hon. John B. Dutcher, president, Pawling, N. Y.; A. C. Chase, treasurer, Syracuse, N. Y.; G. Howard Davison, secretary, Albany, N. Y.

(Copy.)
Department of Agriculture, Indiana,
Indianapolis, February 25, 1893.

Mr. J. Schall Wilhelm, Harrisburg, Pa.

Dear Sir: So far as I can, I will comply with your requests in your letter of the 22d inst.

Our fair for 1893 will be held on September 18th to 23d, inclusive. The premium lists for the present year will be ready about the first of June, and I will try to comply with your request.

The attractions that have come to my notice will, without an exception, be rejected. There are none of the so-called special attractions that will pay fifty per cent. of their cost.

Our report of 1892, like yours, is in the printer's hands, and I will send you one, or as many as you will need, when they are ready.

Many branches of what would be a part of the Department of Agriculture, in Indiana, are directed by Purdue University, and are so much better cared for that there is a universal disposition to let them remain where they now are. The farmers' institutes that are held in



SCHULING, 3350.

Milk Record: 88 lbs. in one day; 2,500 lbs. 11½ oz. in 30 days, and 9,759 lbs. 15 oz. in six months and sixteen days. Among many other prizes to her credit, she won at Western Pennsylvania Agricultural Association, 1887; Grand sweepstakes premium, competing against all breeds, including Short-horns, Ayrshires, Devons and Jerseys. Now (4-26-93) owned by JAB. L. HENDERSON & SONS; paid \$400 for her at dispersion sale, Feb. '92. Above picture, a poor one, she has enormous milk veins.

every county in the state, are managed by this institution, and the scientific and practical ideas are here interchanged in a way that the professor, as well as the farmer, is benefitted. The department of railroad steam engineering is attracting attention from the world, and is a branch that, it is believed, will become one of the most practical of all branches now pursued.

While we have, in years past, received aid from the state, we are now compelled to exist by our own resources, and we are inclined to boast that our plant is the equal of any in existence.

Trusting that this information will be of some benefit to you, I am,

Respectfully,

(Signed.)

CHAS. F. KENNEDY,
Secretary.

Ohio State Board of Agriculture,
Secretary's Office, Columbus, February 25, 1893.

J. S. Wilhelm, Secretary State Agricultural Society, Harrisburg, Pa.

My Dear Sir: Replying to your favor of the 22d inst., I welcome you to the brotherhood of secretaries of state fairs, and will be glad to cooperate with you in any way that we can to further the interests of agriculture. I will reply to your questions in their order.

1st. We have decided to hold a state fair, August 28th to September 1st.

2d. Will send you a premium list when we receive it from the printer, which will not be for six weeks or more.

3d. We have no special attractions, except the trotting dog, "Doc," which we had last year, and we were very well satisfied with it.

4th. I send you our last annual report. The report for 1892 will not appear until the latter part of the summer, as we do not send the matter to the state printer until March, and then we wait from three to six months for the report.

5th. As to your general question in regard to the progress made in the development of agriculture, I have to say that the work of the state board of agriculture is enlarging. Our board not only conducts the state fair, and owns its own grounds and improvements, but we are required to sample, have analyzed, and make report of all fertilizers sold in the state. We have to hold institutes, and, in the season now closing, we have held one hundred and fifty-two, in eighty-five counties of the state, leaving three counties where no institutes have been held. These are the mining counties.

6th. I hope the Legislature will grant your request for \$100,000, to establish permanent fair grounds. The Ohio board purchased the ground at Columbus out of its earnings from the state fair, and then placed the grounds in the hands of the state, and requested appropriations, from year to year, for the improvement of these grounds. We have now about all the buildings we need, and the legislature annually gives us assistance for the payment of bonds we issued for improvements.

We do not occupy as responsible a position in the management of the dairy and food business as you seem to think. We have a dairy and food commissioner, an elective officer, in this state, who seeks legislative enactments bearing upon the adulteration of food, and he includes the manufacture of butter, cheese, oleomargarine, &c.

The grange has, for some years, advocated the idea of special instructions in agriculture in our public schools, but our board has not taken any definite action on that subject.

The experiment station is under a board of control, separate from the state board of agriculture. The agricultural college is a branch of the state university, under the university board. We co-operate with them as largely as we can, and they assist us at our farmers' institutes.

Wishing you success in your position, I am

Yours very truly,

(Signed.)

L. N. BONHAM,
Secretary.

(Copy.)

State of Tennessee,
Department of Agriculture,
Nashville, Tenn., February 27, 1893.

J. Schall Wilhelm, Secretary, &c., Harrisburg, Pa.

Dear Sir: I have your favor of February 22d, and have carefully noted contents. I am, indeed, pleased to know that the agricultural interests of your State are progressing and improving.

During the last two years, as the head of this department, I have undertaken, as a kind of missionary work, and without any especial appropriation for the purpose, the organization of county farmers' institutes in Tennessee, and have succeeded in organizing about two-thirds of the ninety-six counties of the state. I have strong hopes that the work thus begun, under circumstances not the most favorable, will ultimately lead to great and grand results in the promotion of agriculture.

This department has recently issued a work which is designed as an immigration document, and to present to the world, in striking form, our wonderful resources and possibilities, which work is entitled "Tennessee: Its Resources, Capabilities and Development. Illustrated by Graphics," and copies of which will be placed in the reading rooms of the leading hotels and libraries throughout America, some copies also being sent to European countries. I am mailing you a copy of this book to-day, which I wish safely received.

I will mail you biennial report as soon as it comes from the printer. There is now a bill before the general assembly to change this office from a department to a board, and this bill will, I think, be unanimously recommended for passage by the agricultural committee, and will probably become a law. I think such a change will be a decided move forward. The farmers of this state, especially of the cotton area, are learning the evils of the one crop system, and are turing more and more each year to a greater diversity of products.

Very truly yours,

(Signed.)

D. G. GOODWIN,
Commissioner.

Copies of "Tennessee: Its Resources, &c.," will be sent, free of charge, to all requesting it.

(Copy.)

Illinois State Board of Agriculture,
Springfield, Ill., February 27, 1893.

Mr. J. Schall Wilhelm, State Agricultural Society, Harrisburg, Pa.

Dear Sir: Replying to your favor of the 22d inst., have to say that the Illinois State Board of Agriculture will hold no state fair in 1893, on account of the World's Columbian Exposition, to be held within our borders.

Our usual bill for the appropriation from the state, necessary for the maintenance of this department, has been introduced in the legislature now in session.

We take pleasure in sending you, by express, a copy of our 1891 annual report, and also our December, 1892, crop and statistical report.

Yours truly,

(Signed.)

W. C. GERRARD,
Secretary.

(Copy.)

Office of the Commissioner of Agriculture,
Statistics and History,
Austin, Texas, February 28, 1893.

Mr. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: In compliance with your request of the 22d inst., I send you my last report, and will send you the next in a short time.

Texas is developing her agricultural resources rapidly, leading all her sister states in the production of cotton, and will soon outstrip them in other products.

Your State is progressing rapidly in agriculture, and you seem determined that the secrets of nature shall assist you in production.

Respectfully,

(Signed.)

JNO. E. HOLLINGSWORTH,
Commissioner.

(Copy.)

Iowa State Agricultural Society,
Des Moines, Iowa, March 1, 1893.

J. Schall Wilhelm, Sec. State Agricultural Society, Harrisburg, Pa.

Dear Sir: I have your favor of 22d, and take great pleasure to reply to your inquiries.

1. We have decided to hold a state fair at Des Moines, in 1893, September 1st to 8th, inclusive.

2. Will send you our premium list as soon as they are ready for distribution.

3. No decision has yet been reached for attractions at the fair. In fact, it is hard to get a new attraction that would add pleasure for the people. If you have anything new to suggest, I should be pleased to hear from you.

4. I will mail you our last published report, and shall place your

name on our list of exchange for future volumes. We should be glad to have your reports regularly.

5. We are still progressing in the way of newspapers, farmers' institutes and geological surveys, in the development of our state.

The farmers' institutes are no way connected with this society. Each county can hold a meeting, and is allowed \$50.00 for expenses by the state. We have a law to prohibit the sale of oleomargarine butter, but I am one of those who believe that I have a right to eat this kind of butter if I want to. I would sooner have it to-day than one-half of the creamery butter that is made.

This society receives no state appropriation, except for the publication of three thousand annual reports. We depend entirely upon the gate receipts at the fair to pay our premiums and expenses, which we have always done. Awaiting your further pleasure,

Yours truly,

(Signed.)

JOHN R. SHAFFER,
Secretary.

(Copy.)

Massachusetts State Board of Agriculture,
Boston, March 1, 1893.

J. Schall Wilhelm, Sec. State Agricultural Society, Harrisburg, Pa.

Dear Sir: Your esteemed favor of the 22d inst., received. In reply will say:

(1.) That our report, "Agriculture of Massachusetts," will not be received from the printers until the last of this month, when we shall be happy to send you a copy. I desire to thank you in advance for the copy of yours which you offer to send us.

(2.) We are working along the usual lines of work for agriculture with fair success. Our institutes, of which our societies hold about 125 each year, under the direction of the board, have been unusually interesting and profitable the past winter. Most of our thirty-eight agricultural societies are prospering, and each hold a cattle show and fair in the autumn, in addition to the institutes referred to above.

Our agricultural college is prospering, and the number of students increasing. The trustees have under advisement a plan for a short, or two years' course, in addition to the present four years' course, and also a proposition to increase the requisites for admission to the four years' course. The trustees have asked the legislature for an appropriation of about \$40,000, for the erection of a new farm barn and stable for the college, a building for a dairy school, &c. We expect that most of the sum will be granted for these purposes.

We have also on the hands of the board, the task of preventing the spread, and trying to exterminate, the imported pest, the *Ocneria dispar*, or Gypsy moth. It is, at present, confined to thirty townships in this state; appropriation for the work: \$50,000 in 1890, \$50,000 in 1891, \$75,000 in 1892, and the committee in charge have asked for \$165,000 for the present year. The legislative committee on agriculture have reported in favor of the whole sum, but it is feared that the committee on finance will reduce the amount one-third or more. You will find a report of the 1891 work in my last report, and of the 1892 work in the forthcoming report, which I have above promised to send

to you. We feel that this matter is of importance to all the people of the country, as well as to those within the boundary of this state. I think we should apply to the National Government for means to carry on the fight, were it not for the great amount of dirty politics that pervades Washington legislation, and the almost certain delay that would attend action by Congress. In this matter, delay is not only dangerous but fatal. I wish we might be reinforced in our work by the good wishes and expressed interests of the agriculturists of other states, for we have a hard task to convince the politicians and the unthinking portion of our people, of the magnitude of the past, and the danger to all trees and vegetation from this creature.

The legislature of 1891 provided for a dairy bureau of this board. Its duties are defined by the act creating it, which will be found in the first report of the bureau, printed in my last year's report. That annual report will also give you information as to the work of this bureau. The bureau's report for 1892 will be included in my report, "Agriculture of Massachusetts," for 1892, which I am to send you.

The oleomargarine manufacturers have made a bitter fight in the courts against the enforcement of our law against the sale of imitation of dairy products. They have assumed the expense of defending all dealers prosecuted by us, and their policy is to appeal all cases, and carry them to the state supreme court on exceptions, whenever possible. They have also taken one or two cases to the United States Supreme Court. Our state supreme court has, thus, far, sustained our law, but new points are soon to be argued before it.

You refer to an effort in your Legislature for the enactment of a law to prohibit the sale of oleomargarine as butter. We supposed you had now such a law in force in your State. I should be under obligations if you would write me more fully of the status of your present law, and send me a copy of your proposed new law. We are not trying for any further legislation on these matters this year. Individuals have petitioned to have the milk standard of the state reduced to 12 degrees, but the board of agriculture has no part in the effort.

Thanks for your communication, and I shall be glad to hear from you again on matters of interest to you, and to us agriculturists.

Very respectfully yours,

(Signed.)

WM. R. SESSIONS,
Secretary.

(Copy.)

New York State Agricultural Society,
Albany, N. Y., March 3, 1893.

Mr. J. Schall Wilhelm, Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa. •

Dear Sir: Please let me know what action has been taken by your legislature in regard to the bill appropriating \$100,000 for the benefit of your society. I hope it will pass and receive the sanction of the Governor.

Yours truly,

(Signed.)

G. HOWARD DAVISON,
Secretary.

(Copy.)

State fair, September 18, 19, 21, 22, 1893.

Office Rhode Island State Fair Association.
Narragansett Park, Cranston, R. I., March 11, 1893.

J. Schall Wilhelm, Secretary, Harrisburg, Pa.

Dear Sir: Your favor of the 22d ultimo, at hand, and contents duly considered. Answers to questions:

1st. Our association claims the dates of September 18th to 22d for the state fair of 1893.

2d. We have placed your name on the list of addresses for our premium list, and will forward you one when issued.

3d. We have not definitely decided upon any new attractive features for this year's exhibition, but intend to enlarge our departments, so that farmers can earn more money, believing it best to give a practical as well as a "showy" fair.

4th. We have sent your address to the secretary of the state board of agriculture, and he will forward you a report very soon, as they are now in the printer's hands.

Command me, if I can furnish any further information.

Yours cordially,

(Signed.)

DAVID S. COLLINS,
Secretary.

(Copy.)

The Michigan State Agricultural Society,
Lansing, Mich., March 14, 1893.

Mr. J. Schall Wilhelm, Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: I have your communication of February 22d, and in reply will say:

1st. We have not decided on date, nor on the matter of holding fair. Probably will not hold one.

2d. Will send list if fair is held.

3d. No.

4th. Will have a copy of the report of state board of agriculture sent, which contains our report also.

5th. I believe our state is making fair progress in agriculture. Nearly every county has an agricultural society, and holds an annual fair. Some of these county fairs are very successful in attendance, and exhibition of stock and farm products. We have lately increased the number of farmers' institutes held in the state, and very many localities hold an institute without state aid. A bill is now before the Legislature, making an appropriation which will provide a state institute in each of the agricultural counties. A large amount of underdraining is done each year. There is an increase in new products. Flax culture is receiving considerable attention in one county (Sanilac), and hundreds of acres were grown in 1892. There are three mills where fibre is prepared for market. Beans, potatoes and hay, increase in average, and take the place of wheat as a "money" crop.

One important advance is in the improvement of some of the low-

lands, bordering the Saginaw river. Here the land lies so near the level of the water, that levees are needed to protect the lands from overflow from the river. Some large tracts are being improved in this way. A dredge is used to dig a canal or large ditch, and the earth makes the levee. The water collects in the large ditch, and is pumped out by means of a large pump, run by steam. In this way the water, and, consequently, the moisture, can be almost absolutely controlled. Those who are going into this work expect to grow hay, and figure on good returns. Much of the pine timber land in the state is good soil, and, when the stumps are removed, fine farms are made. Annually, a large amount of this land is improved. The stumps make durable and substantial fencing. Our state agricultural society has done much for agriculture, and we hope it will do still more, although, owing to exceedingly bad weather, the receipts for 1892 were light (I send you report of winter meeting). One agricultural college is flourishing and spreading much agricultural information, in addition to the ordinary college work for the students.

Our state agricultural society asked this year for a small appropriation (\$11,000 annually), which we hope will be granted. The state has given the society nothing for many years, and never but little. The legislation which creates most interest with the farmers is on the "road question." A bill has passed the house granting townships and counties the power, if they choose, to construct roads with county or township funds, raised by general tax, or counties can issue bonds. This has not been legal heretofore.

Our state board of agriculture will issue what they call a "Columbian Report," containing, as far as possible, a short history of agriculture of the state, its products in live stock, grain, fruit, &c., and its present condition.

Yours truly,

(Signed.)

I. H. BUTTERFIELD,
Secretary.

(Copy.)

Illinois State Board of Agriculture,
Springfield, Ill., March 18, 1893.

Hon. J. Schall Wilhelm, Secretary State Agricultural Society, Harrisburg, Pa.

Dear Sir: We are in receipt of the 1892 report of your State Agricultural Society, for which please accept thanks. It is a valuable addition to our library.

The American Express Company charged us forty-five cents on its delivery, which circumstance is mentioned because of the fact that a number of times, recently, double charges have been made on packages sent and received by us, and we would like to know if such is the case this time.

Yours truly,

(Signed.)

W. C. GARRARD,
Secretary.

(Copy.)

Missouri State Board of Agriculture,
Columbia, Mo., March 21, 1893.

J. Schall Wilhelm, Sec. State Agricultural Society, Harrisburg, Pa.

Dear Sir We are to-day in receipt of a copy of the report of the Pennsylvania Agricultural Board, which, we presume, comes from your hands, per your letter of February 22d. Please accept thanks for your kindness. It is a highly creditable volume, and indicates a good degree of agricultural prosperity in Pennsylvania. The Missouri agricultural report will soon be ready for distribution, when a copy will be sent you.

During the last few years our state has been moving forward, agriculturally, in quite a satisfactory manner. Until two years ago, our state legislature had done very little for the development of agricultural interests. An appropriation was then secured by the board of agriculture, which permitted a considerable expansion of work in the direction of farmers' institutes, monthly crop reports, weather service work, veterinary, and other lines. The result was a marked awakening of thought among the farmers, and more intelligent methods are being put into practice.

It is, of course, too soon to expect a revolution, but, if the good work is continued a few years, it will come.

I hope you secured the \$100,000 for a permanent home. It is one of our greatest needs, and, until further secured, the best work cannot be done.

We also tried to get an oleomargarine bill passed during the session of the legislature now closing, but failed. I hope your bill got through.

The resolutions favoring the introduction of the elements of agriculture into the common schools, is in the right direction, and, to my mind, until this is done, the efforts to advance agriculture will be largely unavailing. It is the dream of my life to see a strong movement towards that end, and I note with pleasure the growing sentiment in its favor.

Respectfully,

(Signed.)

LEVI CHUBBUCK.

(Copy.)

Iowa State Agricultural Society,
Des Moines, March 22, 1893.

J. Schall Wilhelm, Sec. State Agricultural Society, Harrisburg, Pa.

Dear Sir: I have the honor to acknowledge receipt of the valuable report of your society, for the year 1892, and for which you have our thanks. I should be pleased if you would forward me another copy.

Yours truly,

(Signed.)

JOHN R. SHAFFER,
Secretary.

(Copy.)

Pueblo, Colorado, March 27, 1893.

J. Schall Wilhelm, Esq., Secretary Pennsylvania State Agricultural Society, Harrisburg, Pa.

Dear Sir: Your letter to hand. In reply, the Pueblo State Fair Association will not hold a fair this year, owing to the distance of our grounds from the city. If we do, I will write you again, and give you all the information that is in my possession on the questions noted.

Yours truly,

(Signed.)

JNO. K. SHIREMAN,

An invitation was received from the Indiana County Agricultural Society, for the Pennsylvania State Agricultural Society to hold a joint exhibition, September 11, 12, 13, 14 and 15, 1893, with them, under the auspices of Thirty-ninth Pennsylvania State Agricultural Society's Fair, and Eighth Meeting of Pennsylvania State Association of Trotting Horse Breeders, with Thirty-seventh Meeting of the Indiana County Agricultural Society, Indiana, Pa.

At one time it was thought advisable to not hold a "State Fair" this "Columbian" year, owing to the World's Fair at Chicago, Ill., but satisfactory arrangements having been made, the Pennsylvania State Agricultural Society held its thirty-ninth annual exhibition at Indiana, Pa., September 11, 12, 13, 14 and 15th, 1893, in conjunction with the Indiana County Agricultural Society, and the Pennsylvania State Association of Trotting Horse Breeders, as recited above.

The show grounds of the Indiana County Agricultural Society are among the largest and best equipped in the State, reflecting much credit upon its officers, the society and the county. The buildings are large, commodious and well adapted for the various uses for which they are intended.

The show of live stock at this meeting was a very large and creditable one, demonstrating the rapid strides made by the farmers of the Keystone State, in raising the best of the various breed. The products of the farm, the garden and the loom, exhibited at this meeting, was a very large, creditable and interesting one, as well as that of the farm implements and utensile. The display of domestic and household arts was a very large and creditable one, making it difficult for the judges in this department, as well as for the judges in the live stock department, farm implement department, the department of the products of the farm, the garden and the loom, to do justice to the various exhibitors, so close was the line of competition drawn.

It is as yet too early to report upon the financial part of the fair. This will appear in the next annual report of the treasurer, but, when the final balance is struck, it is "estimated" that the proportion due the Pennsylvania State Agricultural Society will be about \$500.00.

This sum would have been largely increased with better railroad rates and facilities. This was promised on the part of the railroad companies, but they failed to put a single "State Fair Exhibition" excursion ticket on sale, as well as to do any advertising, both of which were promised verbally and in writing. This was not discovered until too late to rectify. The unusual amount of travel incident to the

World's Fair at Chicago, and the immense amount of work and advertising in this direction, may solve the failure to properly take care of the Pennsylvania State Agricultural Society.

The following report of the committee on awards will show, to a certain extent, the large and varied exhibits at the Thirty-ninth Annual Exhibition of the Pennsylvania State Agricultural Society:

HOG CHOLERA.

By J. Schall Wilhelm.

Several years ago I built, on the "Paxtang Farm," two and one-half miles east of Harrisburg, Pa., a hog pen 100 feet long by 26 feet wide, a six-foot passage-way running through the centre of the building, with stall on both sides. At that time we had on hand about 50 or 60 head of Chester White hogs.

I was anxious to see this building filled with hogs, and, shortly afterwards, when I was at the Harrisburg stock-yards, I purchased 249 head of "Buffalo" stock hogs, ranging in weight from 80 to 120 pounds, and in the cool of the evening had them driven to Paxtang.

At the time of purchase they appeared healthy and in good condition. The next morning I found they were not looking quite so well, although they ate with a relish. The following morning they refused to eat. I then noticed them coughing. They commenced to swell up. The manure was very thin and white, and, at the same time, very offensive. Next their bellies commenced to turn red, from the throat back, and the flesh to decay around the ears. In the meantime I had, of course, recognized the dread disease "hog cholera." I employed several veterinary surgeons, but the hogs continued to die like flies. Some of the medicine given them by the veterinary surgeon was enough to kill the hogs.

The 50 or 60 Chester Whites we previously had on hand contracted the dreaded disease, and commenced dying with the others.

One morning, just after we had loaded up several carloads of dead hogs for burial, I was so disgusted that I determined, after breakfast, to kill every one of them, and put the poor brutes out of their misery.

Just at this time I was called upon by a man from Harrisburg, named Leonard Johnson, who asked the privilege of treating them, saying that I should place a value on each one, and every one that died after he started to treat it he would pay for. I was impressed with his talk, and went to the pen with him. At this time there were in the neighborhood of 100 to 110 living. About 15 or 20 Johnson picked out as past cure, saying they were virtually dead then. He treated them, however, and saved about 12 of those pronounced dead. Eighty-four were saved from the entire lot. His mode of procedure was as follows: He gave them a white powder, which he dissolved in water, and which he called "lemonade." The hogs drank it with a

relish. This is all he did to them the first day. I think the white powder was nothing more than magnesia. The next day he picked up each hog, and poured down its throat about a quart of nothing more nor less than crude petroleum, which he called "Leonard's Lightning Liniment." In twenty-four hours after his treatment, the manure changed to the ordinary consistency; and in forty-eight to sixty hours they commenced to prick up their ears and eat.

I am told that microscopical examination has revealed the fact that the germ of the hog cholera is similar to that of the germ in human beings, except smaller.

After Johnson had finished treating the hogs, he saturated the floors and sides of the pen with petroleum, using a little over 600 gallons to kill all germs of the disease.

Petroleum has long been used as a disinfectant and a parasite killer. Saturate a sponge with petroleum, and no animal or insect will live in it. On the other hand, saturate a sponge with carbolic acid, &c., &c., and insects will live in it for some time.

At one time we had considerable trouble with our cattle aborting. We tried isolating, and everything we knew, but the trouble continued. I used this crude petroleum through the stalls, and the odor killed the germ, since which time we have had no trouble in this connection.

While Leonard claims some especial ingredients in his medicine, I feel satisfied it was simply crude petroleum, and I give this information to the public for what it is worth.

ROAD MAKING.

By J. Schall Wilhelm.

So much has been said on this important subject, and so little accomplished, that it seems to me the time has arrived when some definite action should be taken to better improve our public road system in the great Keystone State. Our Legislature appointed a committee to discuss, look into and inquire the best and cheapest way to improve the public highways, but they have virtually accomplished nothing. It is a well-known fact that Pennsylvania does not rank in the front column, so far as its public roads are concerned. There is no excuse for this, as we have everything necessary or requisite in the State to have a system of highways unsurpassed by none.

I appreciate the fact that almost every person has a different idea as to best mode, means or appliances to improve our roads; and, at the same time, I appreciate the fact that there is but one way, and that is the "right way," to improve them, be that mode, or way, what you please. I do know that our present system is not only wrong but, in the main, absurd, for the supervisor of the different townships to go along the highways during the spring of the year, and here and there throw up dirt from the gutters to the middle or the centre of the road,

to be washed back into the gutters by the rains of the summer, ready for a similar work the following spring.

In the spring of the year it is almost impossible for our farmers to take their grain to the mill, or their marketing to the city, without sinking in the mud up to the hubs, and then with only a partial load on the wagon. On account of mud roads, half of our farmers are practically isolated from business and trade one fourth of every year.

We should send representatives to the Legislature who will immediately take up this important subject, and devise the best ways to improve our highways, and then act.

In my judgment, the proper way to proceed would be:

1st. To employ a competent State engineer, he to select his assistants, all at the State expense. They should lay out a system of convenient and straight roads, and abandon some of the crooked and circuitous roads we have at the present, which, from appearances, doubtless years ago were cow paths.

Pennsylvania is unequaled in its mineral resources. We have our mountains filled with coal, and our valleys with clay. At the same time, looking over our State reports, I find our prisons and jails in a healthy condition. Why cannot this coal in our mountains, and the clay in our valleys, and the prison labor, be used in the manufacture of vitrified bricks for our roads? Make a permanent road. Suppose only one mile per year were made in each township. Make that one mile good, and, in a few years we shall have such a system of roads in Pennsylvania as we can feel justly proud of, while now our roads are a disgrace.

The privilege of the tax-payer to work out his road tax is a good one, if done under the direction of a competent engineer.

Our present system of piked roads, while superior to the dirt roads, is primitive, and the roads are always requiring repairs. If this suggested system should be adopted, as has been done in several of the states, each township should be supplied with a road scraper, a stone crusher, and a steam roller. As a labor-saving power, they will soon pay for themselves.

I think it would be productive of much good if each agricultural society in the State would offer a premium for the best essay on the subject of "The Best and Cheapest Way to Improve our Public Roads." This would incite the people to thought, and interest every one in this important subject.

Again, it would be a good idea if each one of our agricultural societies would appoint a committee of one or two competent persons, to meet, say, in the city of Harrisburg, and discuss the question. Similar committees to be appointed by the granges, alliances, and other kindred organizations. A mass meeting of this kind and for this purpose, would be productive of much good; and, I feel confident, the best and cheapest system would be speedily adopted.

I, for one, would be in favor of creating a State debt for the improvement of our public highways. It will certainly be of great benefit to after generations, and they should help to pay for them. The State of Pennsylvania ought not, and should not, be behind its sister states in the improvement of its public roads. I know that Pennsylvania has the material to make as good and as cheap roads as any other state in the Union.

New Jersey is far ahead of us in the betterment of its highways, and it has not the material for the improvement of its roads equal to Pennsylvania.

All that we want is to adopt the best and cheapest system, and then act. How far would the many millions of dollars that have already been uselessly spent in the improvement of our public roads, go to making a thorough, practical and permanent system of roads, no one can tell; but I do know that we would all be astonished.

A small magazine is published by Isaac B. Potter, of New York, in the interest of good roads, by the League of American Wheelmen, entitled "Good Roads." Much valuable information can be gleaned from this book, and every one interested in this great question should secure a copy of it.

In conclusion, I desire to say that I hope this question of public roads will soon be the all-absorbing topic; and that every one interested in this question will give his views.

Even though they be as crude as my own, they will be of great benefit in adopting the best system.

THE GUERNSEY.

The Typical Animal for the Farmer.

By J. Schall Wilhelm.

The Guernsey combines three qualities, which you can find in no other breed.

1. Dairy.
2. Beef.
3. Work.

If you should make an assertion of this kind to the ordinary dairyman, that you can combine beef with the dairy cow, he will quickly tell you this is an impossibility; yet it is not a rarity to produce 14, 15, 16, 17 and 18-pound butter cows of this favorite breed. We have raised Guernsey steers that weighed 1,450, 1,500, and as high as 1,550 pounds, live weight. We have also had a team of Guernsey oxen, and they had no superior. There is a special mark or indentation on their shoulders for the yoke. In view of these facts, it must be admitted that they combine the three qualities I claim for them—dairy, beef and work.

Every analysis that has been made of the milk of this favorite breed, has shown the superiority of the milk over all others. It is, decidedly, the richest in dairy fats.

The meat of the Guernsey is a beautiful yellow, and of the very best, yet I am ashamed to say that it commands from 1 to 1 1-2 cents per pound less than other beef, some people even refusing to buy it, saying it is cow or heifer meat. In this connection, let me ask: What is bet-

ter beef than that from a young heifer or young cow? It is certainly far superior to the ordinary meat.

Years ago people preferred white butter to yellow butter. They have now been educated to the fact that yellow butter is superior to white butter. So must people be educated in regard to beef. The yellow the beef, the better it is.

The cream and butter of the Guernsey remains a beautiful yellow all year. I have often heard charges of coloring the butter of the Guernsey, when I knew that not a grain of coloring matter had ever been used.

The bulls of this breed are very docile. It is a rarity to find one of a cross disposition.

The crossing of a Guernsey bull with a Shorthorn cow, makes a remarkable dairy cow, as well as a beef and work animal. If the superiority of this breed of cattle were known, there would not be bull calves enough in the United States to supply one county in Pennsylvania the first season.

OFFICIAL LIST OF AWARDS

By the Pennsylvania State Agricultural Society and the Indiana County Agricultural Society, September 11, 12, 13, 14 and 15, at Indiana.

DIVISION A—Horses.

Class 1—Clydesdale.

Best stallion, 4 years and over, William Steel, Greensburg, Pa.,.....	\$20 00
2d best stallion, 4 years and over, S. E. Fitzgerald, Bryan, Pa.,.....	10 00
Best stallion colt, William Steel, Greensburg, Pa.,.....	5 00
2d best stallion colt, William Steel, Greensburg, Pa.,.....	3 00
Best mare, 4 years and over, William Steel, Greensburg, Pa.,.....	12 00
2d best mare, 4 years and over, William Steel, Greensburg, Pa.,.....	8 00
Best mare, 3 years old, S. E. Fitzgerald, Bryan, Pa.,.....	10 00
Best mare colt, William Steel, Greensburg, Pa.,.....	5 00

Class 2—English Shire.

Best stallion, 4 years and over, Paul Hacke, Greensburg, Pa.,.....	\$20 00
2d best stallion, 4 years and over, Ira Bloom, Ebensburg, Pa.,.....	10 00
Best stallion, 3 years old, Paul Hacke, Greensburg, Pa.,.....	12 00
Best mare, 4 years and over, T. M. Marshall, Leechburg, Pa.,.....	12 00

Class 3—Percheron.

Best stallion, 4 years and over, Paul Hacke, Greensburg, Pa.,	\$20 00
2d best stallion, 4 years and over, Chas. H. Jennings, Pittsburg, Pa.,	10 00
Best stallion, 3 years old, T. F. Billingslee, Homer City, Pa.,	12 00
Best stallion, 2 years old, George R. Kinnan, Decker's Point, Pa.,	10 00
Best stallion colt, George R. Kinnan, Decker's Point, Pa.,	5 00

Class 4—Standard Bred.

Best stallion, 4 years and over, divided, Denny Bros., Ligonier, Pa.,	\$15 00
Best stallion, 3 years old, Cherry Tree Stock Farm, Grant, Pa.,	12 00
Best stallion, 2 years old, H. S. Bossart, Latrobe, Pa.,	10 00
2d best stallion, 2 years old, Cherry Tree Stock Farm, Grant, Pa.,	6 00
Best stallion, 1 year old, B. Nulton, Kittanning, Pa.,	8 00
Best stallion colt, Cherry Tree Stock Farm, Grant, Pa.,	5 00
Best mare, 4 years and over, Keystone Stock Farm, Kittanning, Pa.,	12 00
2d best mare, 4 years and over, Cherry Tree Stock Farm, Grant, Pa.,	8 00
Best 3 year old mare, Denny Bros., Ligonier, Pa.,	10 00
2d best mare, 3 years old, H. E. Timberlake,	6 00
Best mare, 2 years old, Denny Bros., Ligonier, Pa.,	10 00
2d best mare, 2 years old, Keystone Stock Farm, Kittanning, Pa.,	6 00
Best mare, 1 year old, Cherry Tree Stock Farm, Grant, Pa.,	8 00
2d best mare, 1 year old, Cherry Tree Stock Farm, Grant, Pa.,	5 00

Class 5—French Coach, Cleveland Bays and English Hackneys.

Best stallion, 4 years and over, Paul Hacke, Greensburg, Pa.,	\$20 00
2d best stallion, 4 years and over, Cherry Tree Stock Farm, Grant, Pa.,	10 00

Class 6—Heavy Draft Grade.

Best stallion, 4 years and over, Mont. Stephens, Indiana, Pa.,	\$15 00
Best stallion, 3 years old, H. M. Kinnan, Purchase Line, Pa.,	10 00
Best stallion colt, J. C. Coleman, Elders' Ridge, Pa.,	5 00
2d best stallion colt, Frank Morehead, Onberg, Pa.,	3 00
Best gelding, 4 years and over, J. M. Crissman, Indiana, Pa.,	10 00
Best gelding, 3 years old, J. C. Coleman, Elders' Ridge, Pa.,	10 00
2d best gelding, 3 years old, George Lose, Jr., Blairsville, Pa.,	6 00
Best gelding, 2 years old, Mont. Stephens, Indiana, Pa.,	8 00
2d best stallion, 2 years old, M. H. Henry, Kent, Pa.,	6 00
Best mare, 4 years and over, M. H. Henry, Kent, Pa.,	10 00
Best mare, 3 years old, Joseph Pounds, Crete, Pa.,	10 00
Best mare, 2 years old, M. H. Henry, Kent, Pa.,	8 00
2d best mare, 2 years old, J. M. Heilman, Indiana, Pa.,	6 00
Best brood mare, with foal at foot, Wm. Steel, Greensburg, Pa.,	8 00

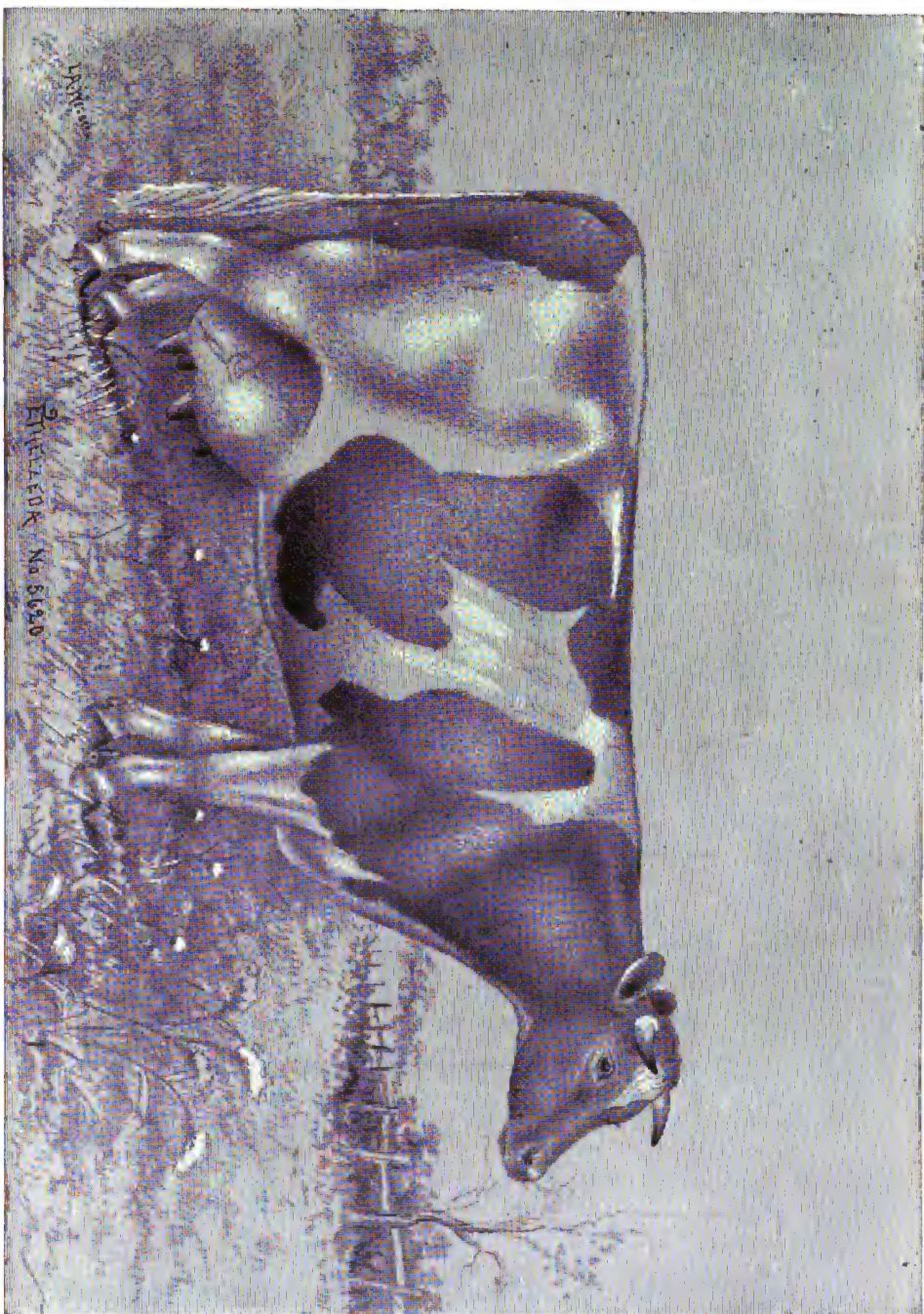
2d best brood mare, with foal at foot, J. C. Coleman, Elders' Ridge, Pa.,	5 00
Best draft team, Jas. Gompers, Indiana, Pa.,	10 00
2d best draft team, R. F. Getty, Chambersville, Pa.,	6 00

Class 7—General Purposes.

Best stallion, 4 years and over, Ira Bloom, Ebensburg, Pa., ..	\$15 00
2d best stallion, 4 years and over, Jos. Rankin, Elderton, Pa.,	10 00
Best gelding, 4 years and over, S. Neal, Elderton, Pa.,	8 00
2d best gelding, 4 years and over, Thomas Bros., Indiana, Pa.,	5 00
Best gelding, 3 years old, J. B. Dickie, Indiana, Pa.,	6 00
2d best gelding, 3 years old, H. J. Crissman, Indiana, Pa., ..	4 00
Best mare, 4 years and over, H. H. Johnston, Indiana, Pa., ..	8 00
2d best mare, 4 years and over, Timothy Demming, Indiana, Pa.,	5 00
Best mare, 3 years old, E. C. Wynkoop, Marion Centre, Pa., ..	6 00

Class 8—Driving and Saddle Horses.

Best stallion, 4 years and over, divided, A. W. Leikert, Blacklick, Pa., \$12.50; B. Nulton, Kittanning, Pa.,	\$12 50
Best stallion, 3 years and over, B. Nulton, Kittanning, Pa., ..	10 00
2d best stallion, 3 years and over, W. F. Hayes, Indiana, Pa., ..	8 00
Best stallion, 2 years old, Keystone Stock Farm, Kittanning, Pa.,	8 00
Best stallion, 1 year old, Keystone Stock Farm, Kittanning, Pa.,	6 00
2d best stallion, 1 year old, W. A. Dible, Parkwood, Pa.,	4 00
Best gelding, 4 years and over, divided, Keystone Stock Farm, \$9.00; Denny Bros., Ligonier, Pa.,	9 00
Best gelding, 3 years, C. J. Hileman, Indiana, Pa.,	8 00
2d best gelding, 3 years, C. W. Crissman, Indiana, Pa.,	5 00
Best gelding, 2 years, M. B. Wynkoop, Marion Centre, Pa., ..	6 00
2d best gelding, 2 years, Henry Bryan, Indiana, Pa.,	4 00
Best gelding, 1 year, Denny Bros., Ligonier, Pa.,	6 00
Best mare, 4 years and over, Keystone Stock Farm, Kittanning, Pa.,	10 00
2d best mare, 4 years and over, B. Nulton, Kittanning, Pa., ..	8 00
Best mare, 3 years, S. C. Coleman, Clarksburg, Pa.,	8 00
Best mare, 2 years, Keystone Stock Farm, Kittanning, Pa., ..	6 00
Best mare, 1 year, Thos. Flemming,	6 00
2d best mare, 1 year, H. M. Coleman, Clarksburg, Pa.,	4 00
Best mare colt, W. A. Dible, Parkwood, Pa.,	5 00
2d best mare colt, S. C. Coleman, Clarksburg, Pa.,	3 00
Best brood mare, foal at foot, W. A. Dible, Parkwood, Pa., ..	8 00
2d best brood mare, foal at foot, S. C. Coleman, Clarksburg, Pa.,	5 00
Best saddle horse or mare, Harry Lewis, Parkwood, Pa.,	10 00
2d best saddle horse or mare, Jos. Polans, Greensburg, Pa., ..	8 00
Best driving team, Jos. S. Polans, Greensburg, Pa.,	10 00
2d best driving team, David Blair, Indiana, Pa.,	8 00



IMPORTED HOLSTEIN-FRIESIAN COW, ETHELZEDA, No. 5620,

Owned by JAS. L. HENDERSON & SONS.

Class 9—Sweepstakes.

Best stallion in classes 1, 2 and 3, Paul Hacke, Greensburg, Pa.,	\$25 00
Best stallion in classes 4 and 5, Keystone Stock Farm, Kit-tanning, Pa., \$12.50; Denny Bros., Ligonier, Pa.,.....	12 50
Best stallion in classes 6, 7 and 8, Harry Lewis, Parkwood, Pa.,	25 00

DIVISION B—Cattle.

Class 1—Short Horns.

Best bull, 3 years and over, Wm. C. Black, Balm, Pa.,.....	\$20 00
2d best bull, 3 years and over, C. A. Kellogg, Claridon, Ohio,.	10 00
Best bull, 2 years old, C. A. Kellogg, Claridon, Ohio,.....	12 00
2d best bull, 2 years old, Ewing O. Craft, Heistersburg, Pa.,.	8 00
Best bull, 1 year old, C. A. Kellogg, Claridon, Ohio,	10 00
2d best bull, 1 year old, T. A. Albon & Son,.....	6 00
Best bull calf, Wm. C. Black, Balm, Pa.,.....	6 00
2d best bull calf, Wm. C. Black, Balm, Pa.,.....	4 00
Best cow, 3 years and over, C. A. Kellogg, Claridon, Ohio, ...	15 00
2d best cow, 3 years and over, Wm. C. Black, Balm, Pa.,....	10 00
Best cow, 2 years and over, T. A. Albon & Son,.....	10 00
2d best cow, 2 years and over, C. A. Kellogg, Claridon, Ohio,..	8 00
2d best cow, 1 year and over, Wm. C. Black, Balm, Pa.,.....	6 00
Best cow calf, T. A. Albon & Son,.....	5 00
2d best cow calf, C. A. Kellogg, Claridon, Ohio,	3 00

Class 2—Aberdeen, Angus and Galloway.

Best bull, 3 years and over, G. M. Earnest, Keffer, Pa.,.....	\$20 00
2d best bull, 3 years and over, Sharp Bros., Uniontown, Ohio,.	10 00
Best bull, 2 years and over, Sharp Bros., Uniontown, Ohio,...	12 00
2d best bull, 2 years and over, G. M. Earnest, Keffer, Pa.,....	8 00
Best bull, 1 year and over, Sharp Bros., Uniontown, Ohio,....	10 00
2d best bull, 1 year and over, Herbert Russ, West Middle-town, Pa.,	6 00
Best bull calf, C. M. Earnest, Keffer, Pa.,.....	6 00
2d best bull calf, Sharp Bros., Uniontown, Ohio,.....	4 00
Best cow, 3 years and over, G. M. Earnest, Keffer, Pa.,	15 00
2d best cow, 3 years and over, Sharp Bros., Uniontown, Ohio,.	10 00
Best cow, 2 years and over, Sharp Bros., Uniontown, Ohio,..	10 00
2d best cow, 2 years and over, Sharp Bros., Uniontown, Ohio,.	8 00
Best cow, 1 year and over, Sharp Bros., Uniontown, Ohio,...	8 00
2d best cow, 1 year and over, G. M. Earnest, Keffer, Pa.,....	6 00
Best cow calf, G. M. Earnest, Keffer, Pa.,	5 00
Best cow calf, G. M. Earnest, Keffer, Pa.,.....	5 00
2d best cow calf, G. M. Earnest, Keffer, Pa.,.....	3 00

Class 3—Red Polled.

Best bull, 2 years old, John A. Cooper, Coitsville, Ohio,.....	\$12 00
Best bull, 1 year old, John A. Cooper, Coitsville, Ohio,.....	10 00

2d best bull, 1 year old, J. M. Jackson, Coitsville, Ohio,.....	5 00
Best bull calf, John A. Cooper, Coitsville, Ohio,.....	6 00
2d best bull calf, J. M. Jackson, Coitsville, Ohio,.....	4 00
Best cow, 3 years and over, John A. Cooper, Coitsville, Ohio,.	15 00
2d best cow, 3 years and over, J. M. Jackson, Coitsville, Ohio,	10 00
Best cow, 2 years and over, John A. Cooper, Coitsville, Ohio,.	10 00
2d best cow, 2 years old, John A. Cooper, Coitsville, Ohio,....	8 00
Best cow, 1 year old, John A. Cooper, Coitsville, Ohio,.....	8 00
2d best cow, 1 year old, J. M. Jackson, Coitsville, Ohio,	6 00
Best cow calf, J. M. Jackson, Coitsville, Ohio,.....	5 00
2d best cow calf, John A. Cooper, Coitsville, Ohio,.....	3 00

Class 4—Hereford.

Best bull, 3 years and over, G. W. Milliken, Youngstown, Ohio,	\$20 00
Best bull, 2 years old, J. A. Creed, Coitsville, Ohio,.....	12 00
2d best bull, 2 years old, G. W. Milliken, Youngstown, Ohio,.	8 00
Best bull, 1 year old, G. W. Milliken, Youngstown, Ohio,....	10 00
2d best bull, 1 year old, J. A. Creed, Coitsville, Ohio,.....	6 00
Best bull calf, G. W. Milliken, Youngstown, Ohio,.....	6 00
2d best bull calf, J. A. Creed, Coitsville, Ohio,.....	4 00
Best cow, 3 years and over, G. W. Milliken, Youngstown, Ohio	15 00
2d best cow, 3 years and over, G. W. Milliken, Youngstown, Ohio,	10 00
Best cow, 2 years old, G. W. Milliken, Youngstown, Ohio,....	10 00
2d best cow, 2 years old, G. W. Milliken, Youngstown, Ohio,.	8 00
Best cow, 1 year old, G. W. Milliken, Youngstown, Ohio,....	8 00
2d best cow, 1 year old, J. A. Creed, Coitsville, Ohio,	6 00
Best cow calf, G. W. Milliken, Youngstown, Ohio,.....	5 00
2d best cow calf, J. A. Creed, Coitsville, Ohio,.....	3 00

Class 5—Holstein.

Best bull, 3 years and over, J. L. Henderson & Son, Washington, Pa.,.....	\$20 00
2d best bull, 3 years old, F. I. Kimball, Greensburg, Pa.,.....	10 00
Best bull, 2 years old, J. D. Dickie, Indiana, Pa.,.....	12 00
Best bull, 1 year old, J. L. Henderson & Son, Washington, Pa.,	10 00
Best bull calf, J. L. Henderson & Son, Washington, Pa.,.....	6 00
2d best bull calf, F. I. Kimball, Greensburg, Pa.,.....	4 00
Best cow, 3 years and over, J. L. Henderson & Son, Washington, Pa.,	15 00
2d best cow, 3 years and over, Jas. M. Quivey & Son, Houstonville, Pa.,	10 00
Best cow, 2 years, J. L. Henderson & Son, Washington, Pa.,..	10 00
2d best cow, 2 years and over, J. M. Quivey & Son, Houstonville, Pa.,	8 00
Best cow, 2 years and over, J. L. Henderson & Son, Washington, Pa.,	8 00
2d best cow, 1 year and over, J. M. Quivey & Sons, Houstonville, Pa.,	6 00
Best cow calf, J. L. Henderson & Son, Washington, Pa.,.....	5 00
2d best cow calf, J. L. Henderson & Son, Washington, Pa.,..	3 00

Class 6—Ayreshire.

Best bull, 3 years and over, R. J. & W. J. Munce, Clokey, Pa.,	\$20 00
Best bull, 2 years old, R. J. & W. J. Munce, Clokey, Pa.,	12 00
Best bull, 1 year old, R. J. & W. J. Munce, Clokey, Pa.,	10 00
2d best bull, 1 year old, Harry R. Munce,	6 00
Best bull calf, Harry R. Munce, Clokey, Pa.,	6 00
2d best bull calf, R. J. & W. J. Munce, Clokey, Pa.,	4 00
Best cow, 3 years and over, R. J. & W. J. Munce, Clokey, Pa.,	15 00
2d best cow, 3 years and over, R. J. & W. J. Munce, Clokey, Pa.,	10 00
Best cow, 2 years old, R. J. & W. J. Munce, Clokey, Pa.,	10 00
2d best cow, 2 years old, Harry Munce, Clokey, Pa.,	8 00
Best cow, 1 year old, Harry Munce, Clokey, Pa.,	8 00
2d best cow, 1 year old, R. J. & W. J. Munce, Clokey, Pa.,	5 00
Best cow calf, Harry Munce, Clokey, Pa.,	5 00
2d best cow calf, R. J. & W. J. Munce, Clokey, Pa.,	3 00

Class 7—Devons.

Best bull, 3 and over, S. W. Guthrie, Indiana, Pa.,	\$20 00
2d best bull, 3 and over, S. F. Weller & Sons, Rehoboth, Ohio,	10 00
Best bull, 2 years old, S. F. Weller & Sons,	12 00
Best bull, 1 year old, S. W. Guthrie, Indiana, Pa.,	10 00
Best bull calf, S. F. Weller & Sons,	6 00
2d best bull calf, S. W. Guthrie, Indiana, Pa.,	4 00
Best cow, 3 years and over, S. F. Weller & Sons, Rehoboth, Ohio	15 00
2d best cow, 3 years and over, S. W. Guthrie, Indiana, Pa.,	10 00
Best cow, 2 years old, S. F. Weller & Sons, Rehoboth, Ohio,	10 00
Best cow, 1 year old, S. F. Weller & Sons, Rehoboth, Ohio,	9 00
2d best cow, 1 year old, S. W. Guthrie, Indiana, Pa.,	6 00
Best bull calf, S. F. Weller & Sons, Rehoboth, Ohio,	5 00
2d best bull calf, S. F. Weller & Sons, Rehoboth, Ohio,	3 00

Class 8—Alderneys or Jerseys.

Best bull, 3 years and over, Miller & Sibley, Franklin, Pa.,	\$20 00
2d best bull, 3 years and over, N. R. Tanehill & Co., Canonsburg, Pa.,	10 00
Best bull, 2 years old, N. R. Tanehill & Co., Canonsburg, Pa.,	12 00
Best bull, 1 year old, N. R. Tanehill & Co., Canonsburg, Pa.,	10 00
2d best bull, 1 year old, W. A. Dible, Parkwood, Pa.,	6 00
Best bull calf, Miller & Sibley, Franklin, Pa.,	6 00
2d best bull calf, N. R. Tanehill & Co., Canonsburg, Pa.,	4 00
Best cow, 3 years and over, Miller & Sibley, Franklin, Pa.,	15 00
2d best cow, 3 years and over, Miller & Sibley, Franklin, Pa.,	10 00
Best cow, 2 years old, Miller & Sibley, Franklin, Pa.,	10 00
2d best cow, 2 years old, Miller & Sibley,	8 00
Best cow, 1 year old, Miller & Sibley,	8 00
2d best cow, 1 year old, Miller & Sibley,	6 00
Best cow calf, Miller & Sibley,	5 00
2d best cow calf, N. R. Tanehill & Co., Canonsburg, Pa.,	3 00

Class 9—Guernseys.

Best bull, 3 and over, Long & Risinger, Homer City, Pa.,.....	\$20 00
Best bull, 1 year old, Long & Risinger,.....	10 00
Best bull calf, Long & Risinger,.....	6 00
2d best bull calf, Long & Risinger,.....	4 00
Best cow, 3 and over, Long & Risinger,.....	15 00
2d best cow, 3 and over, Long & Risinger,.....	10 00
Best 2 year old, Long & Risinger,.....	10 00
Best cow, 1 year old, Long & Risinger,.....	6 00
2d best cow, 1 year old, Long & Risinger,.....	8 00
Best cow calf, Long & Risinger, Homer City, Pa.,.....	5 00
2d best cow calf, Long & Risinger, Homer City, Pa.,.....	3 00

Class 10—Sweepstakes.

Best herd Short-horn, C. A. Kellogg, Claridon, Ohio,.....	\$25 00
2d best Short-horn, Wm. C. Black, Balm, Pa.,.....	15 00
Best herd Hereford cattle, G. W. Milliken, Youngstown, Ohio,	25 00
2d best herd Hereford cattle, G. W. Milliken, Youngstown, Ohio,.....	15 00
Best herd Holstein cattle, J. L. Henderson & Son, Washington, Pa.,.....	25 00
2d best herd Holstein cattle, J. M. Quivey & sons, Houstonville, Pa.,.....	15 00
Best herd Devons, S. F. Weller & Sons, Rehoboth, Ohio,.....	25 00
2d best herd Devon cattle, S. W. Guthrie, Indiana, Pa.,.....	15 00
Best herd Ayreshire cattle, R. J. & W. J. Munce, Clokey, Pa.,.....	25 00
Best herd Jersey cattle, Miller & Sibley, Franklin, Pa.,.....	25 00
2d best herd Jersey cattle, N. R. Tanehill & Co., Canonsburg, Pa.,.....	15 00
Best herd Aberdeen cattle, G. M. Earnest, Keffer, Pa.,.....	25 00
2d best herd Aberdeen cattle, Sharp Bros., Uniontown, Pa.,.....	15 00
Best herd Guernsey cattle, Long & Risinger, Homer City, Pa.,.....	25 00
Best herd Red Polled cattle, John A. Cooper, Coitsville, Ohio,	25 00

Class 11—Jerseys, not Registered.

Best bull, Jas. Gompers, Indiana, Pa.,.....	\$10 00
Best cow, 3 years and over, C. W. Tuck, Homer City, Pa.,....	8 00
2d best cow, 3 years and over, Israel Thomas, Indiana, Pa.,..	6 00
Best cow, 2 years old, Miller & Sibley, Franklin, Pa.,.....	5 00
2d best cow, 2 years old, Israel Thomas, Indiana, Pa.,.....	3 00
Best cow, 1 year old, C. W. Tuck, Homer City, Pa.,.....	3 00
Best cow calf, C. W. Tuck, Homer City, Pa.,.....	3 00
Best fat steer, over 2 years old, G. W. Milliken, Youngstown, Ohio,.....	6 00
Best fat steer, 1 year old, C. A. Kellogg, Claridon, Ohio,.....	5 00

The judge of cattle recommended a premium to Herbert Rush, West Middletown, Pa., the exhibitor of 9 head of Galloway cattle.

DIVISION C—Sheep.

Class 1—American Merinos.

Best ram, 2 years old and over, John Ray, Slate Lick, Pa.,	\$10 00
Best ram, 1 year old, John Ray, Slate Lick, Pa.,	6 00
Best ram lamb, John Ray, Slate Lick, Pa.,	5 00
Best 3 ewes, over 2 years old, John Ray,	10 00
2d best 3 ewes, over 2 years, John Ray,	7 00
Best 3 ewe lambs, over 2 years, John Ray,	5 00

Class 2—Southdowns.

Best ram, 2 and over, W. A. Noble, Becksville, Ohio,	\$10 00
2d best ram, 2 and over, S. E. Fitzgerald, Bryan, Pa.,	8 00
Best ram, 1 year old, W. A. Noble, Becksville, Ohio,	6 00
2d best, 1 year old, W. A. McCoy & Sons, Mercer, Pa.,	4 00
Best ram lamb, S. E. Fitzgerald, Bryan, Pa.,	5 00
2d best ram lamb, W. A. McCoy & Sons,	3 00
Best 3 ewes, over 2 years, W. A. Noble,	10 00
2d best 3 ewes, over 2 years, S. E. Fitzgerald, Bryan, Pa.,	8 00
Best 3 ewes, 1 year old, W. A. Noble, Becksville, Ohio,	6 00
2d best 3 ewes, 1 year old, W. A. McCoy & Sons,	4 00
Best 3 ewe lambs, W. A. Noble,	5 00
2d best 3 ewe lambs, W. A. McCoy & Sons,	3 00
Best ram and five of his get, W. A. Noble,	10 00
2d best ram and five of his get, W. A. McCoy & Sons, Mercer, Pa.,	6 00

Class 3—Shropshire Downs.

Best ram, 2 and over, E. S. Butler, Ridgway, Ohio,	\$10 00
2d best ram, 2 and over, H. W. Chaffee, Becksville, Ohio,	8 00
Best ram, 1 year old, H. W. Chaffee,	6 00
2d best ram, 1 year old, E. S. Butler,	4 00
Best ram lamb, H. A. Chaffee,	5 00
2d best ram lamb, John Getty, Chambersville, Pa.,	3 00
Best 3 ewes, 2 and over, H. W. Chaffee,	10 00
2d best 3 ewes, 2 and over, E. S. Butler,	8 00
Best 3 ewes, 1 year old, H. W. Chaffee,	6 00
2d best 3 ewes, 1 year old, Johnston Morehead, Onberg, Pa., . .	4 00
Best 3 ewe lambs, H. W. Chaffee,	5 00
2d best 3 ewe lambs, J. H. Henderson, Elder's Ridge, Pa., . . .	3 00
Best ram, and five of his get, H. W. Chaffee,	10 00

Class 4—Oxford Downs.

Best ram, over 2 years, Jos. Pounds, Crete,	\$10 00
Best ram, 1 year old, Rinear Bros., Becksville, Ohio,	6 00
2d best ram, 1 year old, Jos. Pounds, Crete, Pa.,	4 00
Best lamb, Rinear Bros., Becksville, Ohio,	5 00
Best 3 ewes, over 2 years, Rinear Bros., Becksville, Ohio,	10 00

2d best 3 ewes, over 2 years, Jos. Pounds, Crete, Pa.,	8 00
Best 3 ewes, 1 year old, Rinear Bros., Becksville, Ohio,	6 00
Best 3 ewe lambs, Jos. Pounds, Crete, Pa.,	5 00
2d best 3 ewe lambs, Rinear Bros., Becksville, Ohio,	3 00

Class 5—Lincolns, Cotswolds and Leicesters.

Best ram, 2 years and over, J. L. Henderson & Son, Wash- ton, Pa.,	\$10 00
2d best ram, 2 years and over, J. L. Henderson & Son, Wash- ington, Pa.,	8 00
Best ram, 1 year old, W. A. McCoy & Sons, Mercer, Pa.,	6 00
Best ram lamb, W. A. McCoy & Sons,	5 00
2d best ram lamb, W. A. McCoy & Sons,	3 00
Best 3 ewes, over 2 years, W. A. McCoy & Sons, Mercer, Pa., ..	10 00
2d best 3 ewes, over 2 years, J. L. Henderson & Sons, Wash- ington, Pa.,	8 00
Best 3 ewes, 1 year old, W. A. McCoy & Sons, Mercer, Pa., ..	6 00
2d best 3 ewes, 1 year old, J. L. Henderson & Sons, Wash- ington, Pa.,	4 00
Best 3 ewe lambs, W. A. McCoy & Sons, Mercer, Pa.,	5 00
2d best 3 ewe lambs, W. A. McCoy & Sons,	3 00

Class 6—Cheviot and Dorset Horn.

Best ram, 2 years old and over, Ewing O. Craft, Heistersburg, Pa.,	\$10 00
Best ram, 1 year old, Ewing O. Craft,	6 00
Best ram lamb, Ewing O. Craft,	5 00
2d best ram lamb, Ewing O. Craft,	3 00
Best 3 ewes, over 2 years, Ewing O. Craft,	10 00
2d best 3 ewes, over 2 years, Ewing O. Craft,	8 00
Best 3 ewes, over 1 year old, Ewing O. Craft,	6 00
2d best 3 ewes, 1 year old, Ewing O. Craft,	4 00
Best 3 ewe lambs, Ewing O. Craft,	5 00
2d best 3 ewe lambs, Ewing O. Craft,	3 00
Best ram, and five of his get, Ewing O. Craft,	10 00

Class 7—Native or Mixed.

Best ram, 2 years and over, M. B. Wynkoop, Marion Centre, Pa.,	\$10 00
Best ram, 1 year old, Jos. Pounds, Crete, Pa.,	6 00
2d best ram, 1 year old, W. A. Evans, Indiana, Pa.,	4 00
Best ram lamb, Johnston Morehead, Onberg, Pa.,	5 00
2d best ram lamb, Jos. Pounds,	3 00
Best 3 ewes, over 2 years, Jos. Pounds,	10 00
2d best 3 ewes, over 2 years, Johnston Morehead, Onberg, Pa.,	8 00
Best 3 ewes, 1 year old, Jos. Pounds,	6 00
Best 3 ewe lambs, Jos. Pounds,	5 00
2d best 3 ewe lambs, W. A. Evans,	3 00
Best 3 fat sheep, Rinear Bros., Becksville, Ohio,	6 00

Class 8—Black Top and Improved Black Top Merinos.

Best ram, 2 and over, Homer Willison, Houstonville, Pa., . . .	\$10 00
2d best ram, 2 and over, Homer Willison,	8 00
Best ram, 1 year old, Homer Willison,	6 00
2d best ram, 1 year old, Homer Willison,	4 00
Best ram lamb, Homer Willison,	5 00
2d best ram lamb, Homer Willison,	3 00
Best 3 ewes, over 2 years, Homer Willison,	10 00
2d best 3 ewes, over 2 years, Homer Willison,	8 00
3 best ewes, 1 year old, Homer Willison,	6 00
2d best 3 ewes, 1 year old, Homer Willison,	4 00
Best 3 ewe lambs, Homer Willison,	5 00
2d best 3 ewe lambs, Homer Willison,	3 00
Best ram, and five of his get, Homer Willison,	10 00

Class 9—National, Dickinson, Standard and Delaine Merinos.

Best ram, 2 years old and over, Thos. McEwen & Son, McConnell's Mills, Pa.,	\$10 00
2d best ram, 2 and over, J. C. McNarry, Canonsburg, Pa., . . .	8 00
Best ram, 1 year old, J. C. McNarry, Canonsburg, Pa.,	6 00
2d best ram, 1 year old, J. C. McNarry, Canonsburg, Pa.,	4 00
Best ram lamb, Thos. McEwen & Son, McConnell's Mills, Pa.,	5 00
2d best ram lamb, J. C. McNarry, Canonsburg, Pa.,	3 00
Best 3 ewes, over 2 years, Thos. McEwen & Son, McConnell's Mills, Pa.,	10 00
2d best 3 ewes, over 2 years, J. C. McNarry, Canonsburg, Pa.,	8 00
Best 3 ewes, 1 year old, Thos. McEwen & Son, McConnell's Mills, Pa.,	6 00
2d best 3 ewes, 1 year old, J. C. McNarry, Canonsburg, Pa., . .	4 00
Best 3 ewe lambs, Thos. McEwen & Son, McConnell's Mills, Pa.,	5 00
2d best 3 ewe lambs, J. C. McNarry, Canonsburg, Pa.,	2 00
Best ram, and five of his get, Thos. McEwen & Son, McConnell's Mills, Pa.,	10 00
2d best ram, and five of his get, J. C. McNarry, Canonsburg, Pa.,	6 00

SWINE—Berkshire.

Best boar, over 1 year, J. M. Quivey & Sons, Houstonville, Pa.,	\$10 00
2d best boar, over 1 year, S. W. Guthrie, Indiana, Pa.,	6 00
Best boar, under 1 year, S. W. Guthrie, Indiana, Pa.,	6 00
2d best boar, under 1 year, J. M. Quivey & Sons, Houstonville, Pa.,	4 00
Best sow, over 1 year, J. M. Quivey & Sons, Houstonville, Pa.,	8 00
2d best sow, over 1 year, S. W. Guthrie, Indiana, Pa.,	5 00
Best sow, under 1 year, J. M. Quivey & Sons, Houstonville, Pa.,	8 00

Poland China.

Best boar, over 1 year, Maharg Bros., Maharg, Pa.,	\$10 00
2d best boar, over 1 year, Johnston Morehead, Onberg, Pa., . .	6 00

Best boar, under 1 year, Maharg Bros., Maharg, Pa.,.....	6 00
2d best boar, under 1 year, Ewing O. Craft, Heistersburg, Pa.,	4 00
Best boar, under 6 months, Maharg Bros., Maharg, Pa.,.....	5 00
2d best boar, under 6 months, Johnston Morehead, Onberg, Pa.,	3 00
Best sow, over 1 year, Maharg Bros., Maharg, Pa.,.....	8 00
Best sow, under 1 year, Johnston Morehead, Onberg, Pa.,....	6 00
2d best sow, under 1 year, Maharg Bros., Maharg, Pa.,.....	4 00
Best sow, under 6 months, Johnston Morehead, Onberg, Pa.,..	5 00
2d best sow, under 6 months, Maharg Bros., Maharg, Pa.,....	3 00
Best litter of pigs, under 3 months, Ewing O. Craft, Heistersville, Pa.,	8 00

Chester White.

Best boar, over 1 year, Maharg Bros., Maharg, Pa.,.....	\$10 00
2d best boar, over 1 year, Willis Whinnery, Winona, Ohio,..	6 00
Best boar, under 1 year, W. A. McCoy & Sons, Mercer, Pa.,..	6 00
2d best boar, under 1 year, Willis Whinnery, Winona, Ohio,..	4 00
Best boar, under 6 months, Willis Whinnery, Winona, Ohio,..	5 00
2d best boar, under 6 months, Maharg Bros., Maharg, Pa.,...	3 00
Best sow, over 1 year, Ewing O. Craft, Heistersburg, Pa.,....	8 00
2d best sow, over 1 year, Willis Whinnery, Winona, Ohio,....	5 00
Best sow, under 1 year, W. A. McCoy & Sons, Mercer, Pa.,....	6 00
2d best sow, under 1 year, Jas. Gompers, Indiana, Pa.,.....	4 00
Best sow, under 6 months, Willis Whinnery, Winona, Ohio,..	5 00
2d best sow, under 6 months, Maharg Bros., Maharg, Pa.,....	3 00
Best litter of pigs, W. A. McCoy & Sons, Mercer, Pa.,.....	8 00

Jersey Red.

Best boar, over 1 year, R. W. Allison, Indiana, Pa.,	\$10 00
--	---------

Yorkshire.

Best boar, over 1 year, Willis Whinnery, Winona, Ohio,.....	\$10 00
Best boar, under 1 year, Willis Whinnery, Winona, Ohio,....	6 00
2d best boar, under 1 year, Ewing O. Craft, Heistersburg, Pa.,	4 00
Best boar, under 6 months, Willis Whinnery, Winona, Ohio,..	5 00
Best sow, over 1 year, Willis Whinnery, Winona, Ohio,.....	8 00
Best sow, under 1 year, Willis Whinnery, Winona, Ohio,....	6 00
Best sow, under 6 months, Willis Whinnery, Winona, Ohio,..	5 00

POULTRY—American.

Best Plymouth Rock fowls, Stewart Bros., Arden, Pa.,.....	\$3 00
2d best Plymouth Rock fowls, Chas. Gammerdinger, Columbus, Ohio,	1 50
Best Plymouth Rock chicks, Stewart Bros., Arden, Pa.,.....	3 00
2d best Plymouth Rock chicks, Stewart Bros., Arden, Pa.,..	1 00
Best white Plymouth Rock fowls, Stewart Bros., Arden, Pa.,..	3 00
2d best white Plymouth Rock fowls, Chas. Gammerdinger, Columbus, Ohio,	1 50

Best white Plymouth Rock chicks, Stewart Bros., Arden, Pa.,	3 00
2d best white Plymouth Rock chicks, R. Shields, Harmon's Creek,	1 00
Best Wyandotte fowls, Chas. Gammerdinger, Columbus, Ohio,	3 00
Best Wyandotte chicks, R. Shields, Harmon's Creek,	2 00
2d best Wyandotte chicks, R. Shields, Harmon's Creek,	1 00
Best silver Wyandotte fowls, Chas. Gammerdinger, Columbus, Ohio,	3 00
2d best Wyandotte fowls, R. Shields, Harmon's Creek,	1 50
Best silver Wyandotte chicks, R. Shields, Harmon's Creek, ..	2 00
2d best silver Wyandotte chicks, Chas. Gammerdinger, Columbus, Ohio,	1 00
Best golden Wyandotte fowls, Chas. Gammerdinger, Columbus, Ohio,	3 00
2d best golden Wyandotte fowls, John Kramer, Columbus, Ohio,	1 50
Best golden Wyandotte chicks, R. Shields, Harmon's Creek, ..	2 00
2d best golden Wyandotte chicks, Chas. Gammerdinger, Columbus, Ohio,	1 00
Best breeding pen, Stewart Bros., Arden, Pa.,	3 00

Asiatic.

Best light Brahma, Chas. Gammerdinger,	\$3 00
2d best light Brahma, John Kramer,	1 50
Best light Brahma chicks, C. Gammerdinger,	2 00
2d best light Brahma chicks, R. Shields,	1 00
Best dark Brahma fowls, John Kramer,	3 00
2d best dark Brahma fowls, C. Gammerdinger,	1 50
Best dark Brahma chicks, G. L. Rudolph, Apollo, Pa.,	2 00
2d best dark Brahma chicks, Chas. Gammerdinger,	1 00
Best buff Cochín fowls, John Kramer,	3 00
2d best buff Cochín fowls, Chas. Gammerdinger,	1 50
Best buff Cochín chicks, C. Gammerdinger,	3 00
2d best buff Cochín chicks, Stewart Bros.,	1 00
Best partridge Cochín fowls, C. Gammerdinger,	3 00
2d best partridge Cochín fowls, John Kramer,	1 50
2d best partridge Cochín chicks, C. Gammerdinger,	1 00
Best white Cochín fowls, C. Gammerdinger,	3 00
2d best white Cochín fowls, John Kramer,	1 50
Best white Cochín fowls, C. Gammerdinger,	3 00
2d best white Cochín fowls, John Kramer,	1 50
Best white Cochín chicks, C. Gammerdinger,	2 00
2d best white Cochín chicks, John Kramer,	1 00
Best Langshan fowls, C. Gammerdinger,	3 00
2d best Langshan fowls, A. J. Carson, Apollo, Pa.,	1 50
Best Langshan chicks, A. J. Carson,	2 00
2d best Langshan chicks, A. J. Carson,	1 00
Best Asiatic breeding pen, C. Gammerdinger,	3 00

Spanish.

Best S. C. brown Leghorn fowls, R. Shields,	\$3 00
2d best S. C. brown Leghorn fowls, Chas. Gammerdinger,	1 50
Best S. C. brown Leghorn chicks, R. Shields,	2 00
2d best S. C. brown Leghorn chicks, Chas. Gammerdinger,	1 00
Best S. C. white Leghorn fowls, Chas. Gammerdinger,	3 00
Best S. C. white Leghorn chicks, R. Shields,	2 00
2d best S. C. white Leghorn chicks, R. Shields,	1 00
Best white Minorca fowls, Stewart Bros.,	3 00
2d best white Minorca fowls, R. Shields,	1 50
Best white Minorca chicks, R. Shields,	2 00
2d best white Minorca chicks, Stewart Bros.,	1 00
Best black Minorca fowls, R. Shields,	3 00
2d best black Minorca fowls, Chas. Gammerdinger,	1 50
Best black Minorca chicks, R. Shields,	2 00
2d best black Minorca chicks, Stewart Bros.,	1 00
Best Spanish breeding pen, Stewart Bros.,	3 00

Polish.

Best white crested fowls, R. Shields,	\$3 00
2d best white crested fowls, Chas. Gammerdinger,	1 50
Best white crested black fowls, Chas. Gammerdinger,	3 00
2d best white crested black fowls, R. Shields,	1 50
Best golden fowls, John Kramer,	3 00
2d best golden fowls, Chas. Gammerdinger,	1 50
Best golden chicks, Chas. Gammerdinger,	2 00
Best silver fowls, R. Shields,	3 00
2d best silver fowls, Chas. Gammerdinger,	1 50
Best silver chicks, Chas. Gammerdinger,	2 00

Hamburgs.

Best black fowls, R. Shields,	\$3 00
Best golden spangled fowls, Chas. Gammerdinger,	3 00
Best silver spangled fowls, John Kramer,	3 00
2d best silver spangled fowls, R. Shields,	1 50
Best silver spangled chicks, R. Shields,	2 00
2d best silver spangled chicks, Chas. Gammerdinger,	1 00

Games.

Best b. b. red fowls, C. Gammerdinger,	\$3 00
Best b. b. red chicks, H. L. Fitzgerald, Apollo, Pa.,	2 00
Best w'y duck wing fowls, C. Gammerdinger,	3 00
Best w'y duck wing chicks, C. Gammerdinger,	2 00
Best silver duck wing fowls, C. Gammerdinger,	3 00
Best Indian Game chicks, R. Shields,	2 00

French.

Best Houdan fowls, Chas. Gammerdinger,	\$3 00
2d best Houdan fowls, John Kramer,	1 50
Best Houdan chicks, Chas. Gammerdinger,	2 00

2d best Houdan chicks, John Kramer,	1 00
Best Crevecœur fowls, C. Gammerdinger,	3 00
Best Crevecœur chicks, C. Gammerdinger,	2 00

Bantams.

Best golden Seabrights, C. M. George, Apollo, Pa.,	\$3 00
2d best golden Seabrights, C. Gammerdinger,	1 50
Best silver Seabrights, R. Shields,	3 00
Best Pekin or Cochin, R. Shields,	3 00
2d best Pekin or Cochin, R. Shields,	1 50
Best Japanese black tail, R. Shields,	3 00
Best b. b. red Games, C. Gammerdinger,	3 00
2d best b. b. red Games, Stewart Bros.,	1 50

Turkeys.

Best bronze, R. Shields,	\$3 00
2d best bronze, Stewart Bros.,	1 50
Best white, R. Shields,	3 00
Best black, R. Shields,	3 00

Ornamental.

Best pearl guineas, Chas. Gammerdinger,	\$2 00
2d best pearl guineas, Stewart Bros,	1 00
Best white guineas, R. Shields,	2 00
2d best white guineas, Stewart Bros.,	1 00
Best silkies, R. Shields,	2 00

Geese.

Best Toulouse,	\$1 50
2d best Toulouse, R. Shields,	75
Best Emden, Stewart Bros.,	1 50
2d best Emden, C. Gammerdinger,	75
Best Chinese white, Stewart Bros.,	1 50
2d best Chinese white, R. Shields,	75
Best Chinese brown, R. Shields,	1 50
2d best Chinese brown, Stewart Bros.,	75

Ducks.

Best Rouen, R. Shields,	\$1 00
2d best Rouen, Chas. Gammerdinger,	50
Best Aylesbury, Chas. Gammerdinger,	1 00
2d best Aylesbury, Stewart Bros.,	50
Best Muscovy, colored, Stewart Bros.,	1 00
2d best Muscovy, colored, Stewart Bros.,	50
Best Pekin, Stewart Bros.,	1 00
2d best Pekin, Stewart Bros.,	50

Sweepstakes.

Best pair of fowls or chicks, any variety, R. Shields,	\$5 00
Largest collection taking premiums, Chas. Gammerdinger, ..	10 00

FARM IMPLEMENTS.

Best display, Sutton Bros. & Bell, Indiana, Pa.,	\$10 00
Best mowers for two horses, Sutton Bros. & Bell,	3 00
Best mower for one horse, Sutton Bros. & Bell,	3 00
Best harvester and binder, Sutton Bros. & Bell,	3 00
Best hay rake, revolving, Sutton Bros. & Bell,	3 00
Best hay rake, spring tooth, Sutton Bros. & Bell,	3 00
Best hay tedder, Sutton Bros. & Bell,	3 00
Best hay fork, Sutton Bros. & Bell,	3 00
Best potato-digging plow, Sutton Bros. & Bell,	3 00
Best road scraper, Sutton Bros. & Bell,	3 00
Best farm wagon, two horse, Irwin Wagon Co., Irwin Station,	3 00
Best farm wagon, one horse, Irwin Wagon Co.,	3 00
Best plow, chilled, Sutton Bros. & Bell, Indiana, Pa.,	3 00
Best plow, steel, Sutton Bros. & Bell,	3 00
Best plow, double mould board, Sutton Bros. & Bell,	3 00
Best hillside plow, Sutton Bros. & Bell,	3 00
Best plow sulkey, landside, Sutton Bros. & Bell,	3 00
Best cultivator, plain, J. C. Morehead, Indiana, Pa.,	2 00
Best cultivator, gang, Sutton Bros. & Bell,	2 00
Best harrow, fixed frame, Sutton Bros. & Bell,	3 00
Best harrow, folding frame, J. C. Morehead,	3 00
Best harrow for smoothing, Sutton Bros. & Bell,	3 00
Best harrow, slanting cutters, Sutton Bros. & Bell,	3 00
Best harrow disks, J. C. Morehead,	3 00
Best harrow, spring tooth, J. C. Morehead,	3 00
Best cornplanter, one horse, J. C. Morehead,	2 00
Best grain drill, two horse, J. C. Morehead,	3 00
Best broadcast seed sower, Sutton Bros. & Bell,	3 00
Best field roller, Sutton, Bros. & Bell,	3 00
Best clod crusher, Sutton Bros. & Bell,	3 00

Work by Motive Power.

Display, Sutton Bros. & Bell, Indiana, Pa.,	\$25 00
Best corn sheller, J. C. Morehead,	3 00
Best separator, Sutton Bros. & Bell,	3 00
Best hay and stock cutter, Sutton Bros. & Bell,	3 00
Best ensilage cutter, Sutton Bros. & Bell,	3 00
Best cider press, Sutton Bros. & Bell,	3 00
Best fanning windmill, Sutton Bros. & Bell,	3 00

Tools and Machinery for Hand Use.

Best lawn mower, Sutton Bros. & Bell,	\$2 00
Best corn sheller, Sutton Bros. & Bell,	2 00
Best hay or stock cutter, Sutton Bros. & Bell,	2 00
Best cider press, Sutton Bros. & Bell,	2 00
Best seed drill, Sutton Bros. & Bell,	2 00
Best corn planter, Sutton Bros. & Bell,	2 00
Best cultivator, Sutton Bros. & Bell,	2 00
Best fruit dryer, S. N. Morehead,	2 00
Best post-hole digger, Sutton Bros. & Bell,	2 00

Class 4.

Best home-made horse shoes, William F. Smith, Indiana, Pa., Diploma
 Best wheelbarrow, A. P. Watson, Indiana, Pa.,.....Diploma

Class 5.

Best cook stove, G. T. Hamilton, Indiana, Pa.,.....Diploma
 Best parlor stove, G. T. Hamilton,Diploma
 Best open grate, G. T. Hamilton,Diploma

Class 6.

Best bee palace, J. L. Getty, Indiana, Pa.,.....Diploma
 Best ornamental fence, Sutton Bros. & Bell,.....Diploma
 Best portable fence, Harry Knee, Kent, Pa.,.....Diploma
 Best corn brooms, W. F. George, Indiana, Pa.,.....Diploma
 Best churn, J. C. Morehead, Indiana, Pa.,.....Diploma
 Best washer and wringer, Sutton Bros. & Bell,.....Diploma

FARM AND GARDEN PRODUCTS.

Best 1-2 bushel red wheat, S. F. Weller & Sons, Rehoboth, Ohio,	\$3 00 and "Farm Journal."	
2d best 1-2 bushel red wheat, S. T. McHenry, Indiana, Pa.,...		\$1 00
Best 1-2 bushel white wheat, S. T. McHenry,	\$2.00 and "Our Country Home," 1 year.	
2d best 1-2 bushel white wheat, C. A. Kellogg, Claridon, Ohio,		1 00
Best oats, Clydesdale, C. A. Kellogg, Claridon, Ohio, "Our Country Home," 1 year.		
Best 1-2 bushel buckwheat, large, C. A. Kellogg, Claridon, Ohio, \$2.00, and the "Farm Journal," 1 year.		
2d best 1-2 bushel buckwheat, large, S. F. Weller & Sons,		1 00
Best 1-2 bushel buckwheat, small, C. A. Kellogg,		2 00
Best bushel rye, S. E. Fitzgerald, Bryan, Pa., \$2.00, and the "Farm Journal," 1 year.		
2d best bushel rye, A. M. Barclay, Kent, Pa.,.....		1 00
Best sweet corn, Frank Daugherty, Indiana, Pa., \$2.00, and the "American Agriculturist," 1 year.		
Best 1-4 bushel flax seed, Thos. Wiggins, Tannery, Pa.,		2 00
2d best 1-4 bushel flax seed, C. A. Kellogg,.....		1 00
Best 1-4 bushel timothy seed, M. A. Wynkoop,.....		2 00
2d best 1-4 bushel timothy seed, S. F. Weller & Sons,.....		1 00
Best 1-4 bushel clover seed, small, C. A. Kellogg, Claridon, Ohio,		2 00
2d best 1-4 bushel clover seed, S. E. Fitzgerald, Bryan, Pa.,...		1 00
Best 1-4 bushel clover seed, small, C. A. Kellogg,.....		2 00

Vegetables.

Best display, 30 varieties or more, Frank Daugherty, Indiana, \$10.00, and the "American Agriculturist," 1 year.

Best display of tomatoes, Frank Daugherty,.....	\$5 00
Best display of onions, A. M. Barclay, Kent, Pa.,.....	5 00
Best basket Burbank potatoes, H. R. Depp, Smathers,.....	1 00
Best basket Early Rose potatoes, H. R. Depp, Smathers,.....	1 00
2d best basket Early Rose potatoes, A. P. Watson,.....	50
Best early Ohio potatoes, W. J. Short, Onberg, Pa.,.....	1 00
Best basket Rural New Yorker potatoes, D. W. Anthony, Parkwood,	1 00
Best basket potatoes, D. W. Anthony, "American Agricultur- ist," 1 year.	
Best basket American Giant potatoes, D. W. Anthony,.....	1 00
Best basket Sweet Giant potatoes, A. M. Barclay,.....	1 00
2d best Volunteer tomatoes, Frank Daugherty,.....	50
Best Acme, Frank Daugherty,.....	1 00
2d best Acme, Mabel Books,	50
Best Trophy tomatoes, A. P. Watson,	1 00
2d best Trophy tomatoes, Mabel Books,	50
Best Matchless tomatoes, Mrs. J. A. Simpson, Indiana, Pa.,..	1 00
Best yellow tomatoes, Frank Daugherty,	1 00
2d best yellow tomatoes, A. P. Watson,.....	50
Best golden Trophy, Frank Daugherty,	1 00
Best 3 heads flat Dutch cabbage, W. A. Evans, Indiana, Pa.,..	1 00
Best Drumhead, Frank Daugherty,	1 00
2d best Drumhead, Mrs. Samuel Bence, Dixonville,	50
Best dark Egyptian beets, Mrs. George Snyder, Indiana, Pa.,..	1 00
2d best dark Egyptian beets, Frank Daugherty,	50
Best early Turnip beets, Mrs. Samuel Bence, \$1.00, and the "Farm Journal," 1 year.	
2d best early Turnip beets, A. M. Barclay,.....	50
Best Mangel Wurzel, A. P. Watson,.....	1 00
Best turnips, W. A. Evans,	1 00
2d best turnips, Paul Hacke, Greensburg, Pa.,.....	50
Best musk melons, W. A. Evans,	1 00
Best water melons, W. A. Evans,	1 00
2d best water melons, A. M. Barclay, Kent, Pa.,.....	50
Best celery, W. A. Evans, "Our Country Home," 1 year, and..	1 00
Best Hubbard squashes, Frank Daugherty,.....	1 00
Best purple egg plants, Frank Daugherty,	1 00
Best carrots, A. M. Barclay,.....	1 00
2d best carrots, Edith Depp, Smathers,	50
Best parsnips, Edith Depp,.....	1 00
2d best parsnips, A. M. Barclay,.....	50
Best display cucumbers, Frank Daugherty,.....	1 00
2d best display cucumbers, A. M. Barclay,.....	50
Best bush beans, Frank Daugherty,.....	1 00

Fruit.

Best display apples, Samuel Bence, Dixonville, \$5.00, and "Farm Journal," 1 year.	
Best Rambo, Mrs. W. J. Short, Onberg, Pa.,.....	1 00
2d best Rambo, Annie Short, Onberg, Pa.,.....	50
Best Baldwin, Mrs. W. A. Glass, Onberg, Pa.,.....	75

Best Ben Davis, A. M. Barclay, Kent, Pa.,.....	75
Best Fallowater, Mrs. W. A. Glass,.....	75
Best Northern Spy, Frank Daugherty,.....	75
Best Rhode Island Greening, Mrs. W. A. Glass,.....	75
2d best Rhode Island Greening, A. M. Barclay,.....	50
Best Roxburg russet, A. M. Barclay,.....	75
Best Siberian crab apple, S. W. Getty, Chambersville, Pa.,..	75
2d best Siberian crab apple, Mrs. W. J. Short,	50
Best Clapp's Favorite pears, Mrs. Christ Cook, Indiana, Pa.,..	75
Best Bartlett pear, Mrs. T. B. Clark, Indiana, Pa.,.....	75
Best Dana's Hovey pears, Mrs. Frank Douglas, Indiana, Pa.,..	75
Best Keiffer's Hybrid pears, Lotta Steving, Indiana, Pa.,....	75
2d best Keiffer's Hybrid pears, Carrie Bell Cook, Indiana, Pa.,	50
Best Lawrence pears, Carrie Bell Cook,	75
Best Sheldon pears, George Snyder, White township,.....	75
2d best Sheldon pears, Mrs. W. A. Glass,.....	50
Best variety peaches, Carrie Bell Cook, "Our Country Home," 1 year.	
Best Crawford Late peaches, Carrie Bell Cook,.....	75
Best Crawford Early peaches, D. W. Anthony, Parkwood, Pa.,	75
Best Old Nixon peaches, Mrs. Christ. Cook, Indiana, Pa.,....	75
2d best Old Nixon peaches, Mrs. W. A. Glass,.....	50
Best Stump of the World peaches, Mrs. W. A. Glass,	75
Best variety of grapes, D. W. Anthony,.....	5 00
Best Bacchus, D. W. Anthony,.....	75
Best Catawba grapes, D. W. Anthony,.....	75
Best Concord grapes, D. W. Anthony,.....	75
2d best Concord grapes, Mrs. Samuel L. Boucher, Dixonville, Pa.,	50
Best Delaware grapes, D. W. Anthony,.....	75
Best Duchess grapes, D. W. Anthony,	75
Best Early Victor grapes, D. W. Anthony,	75
Best Isabella grapes, Mrs. Samuel Boucher,	50
Best orange quinces, J. C. Speedy, Indiana, Pa.,.....	1 00
Best pear quinces, Mrs. Etta Bruce, Indiana, Pa.,.....	1 00
Best plums, Martha Stuchul, Indiana, Pa.,.....	75
2d best plums, J. M. Beer, Indiana, Pa.,.....	50

Flowers.

Best display, Mrs. Belle Thompson,	\$15 00
2d best display, A. Lizzie Stewart, Indiana, Pa.,.....	10 00
Best geranium, Mrs. Belle Thompson,	2 00
2d best geranium, A. Lizzie Stewart,.....	1 00
Best tuberoses, Mrs. M. K. Wilson, Indiana, Pa.,.....	2 00
2d best tuberoses, Mrs. Belle Thompson,.....	1 00
Best begonias, Mrs. Belle Thompson,	2 00
Best chrysanthemums, A. Lizzie Stewart,.....	2 00
2d best chrysanthemums, Mrs. Belle Thompson,.....	1 00
Best China asters, A. Lizzie Stewart,	2 00
Best fuchias, Mrs. Belle Thompson,	2 00
Best carnations, Mrs. M. K. Wilson,.....	2 00
2d best carnations, A. Lizzie Stewart,	1 00

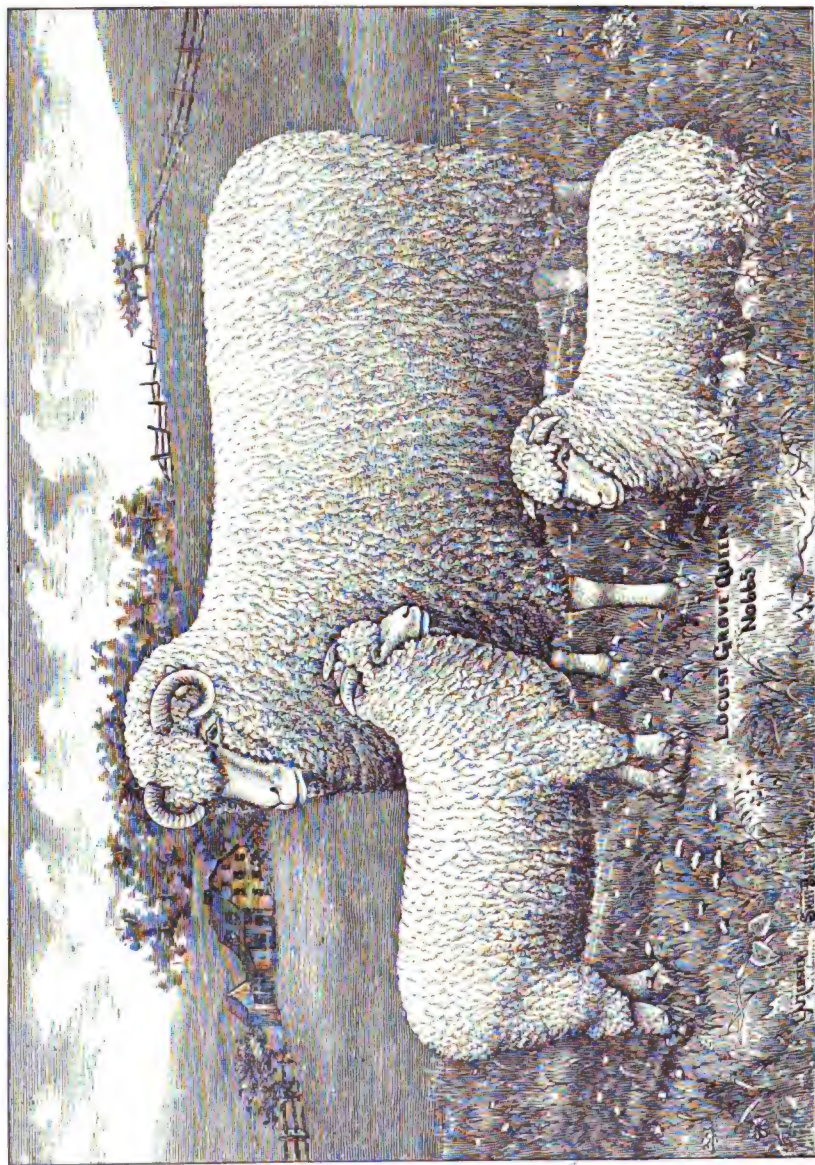
Best pansies, Mrs. J. G. Henry, Indiana, Pa.,.....	2 00
Best foliage plant, Mrs. Belle Thompson,	2 00
Best verbenas, A. Lizzie Stewart,	2 00
Best gladiolas, Mrs. T. D. Clark, Indiana, Pa.,.....	2 00
2d best gladiolas, A. Lizzie Stewart,	1 00
Best nasturtiums, Mrs. J. D. Brownlee, Indiana, Pa.,.....	2 00
2d best nasturtiums, A. Lizzie Stewart,	1 00
Best hanging basket, A. Lizzie Stewart,.....	2 00
2d best hanging basket, A. Lizzie Stewart,	1 00
Best table bouquet, Mrs. J. G. Henry,.....	2 00
2d best table bouquet, Mrs. M. K. Wilson,.....	1 00
Best hand bouquet, Mrs. M. K. Wilson,.....	2 00
Best winter bouquet, Eva Agey, Indiana, Pa.,.....	2 00
2d best winter bouquet, Edward Sutton, Indiana, Pa.,.....	1 00
Best palms, Mrs. Belle Thompson,	2 00
Best display of cut flowers, A. Lizzie Stewart,	2 00
2d best display of cut flowers, Mrs. J. G. Henry,	1 00
Best display of ferns, mosses and wild flowers, Miss Jo. Agey, 2d best display of ferns, mosses and wild flowers, Mrs. Kate L. Dressly, Smathers,.....	1 00

FINE ARTS—Crayon.

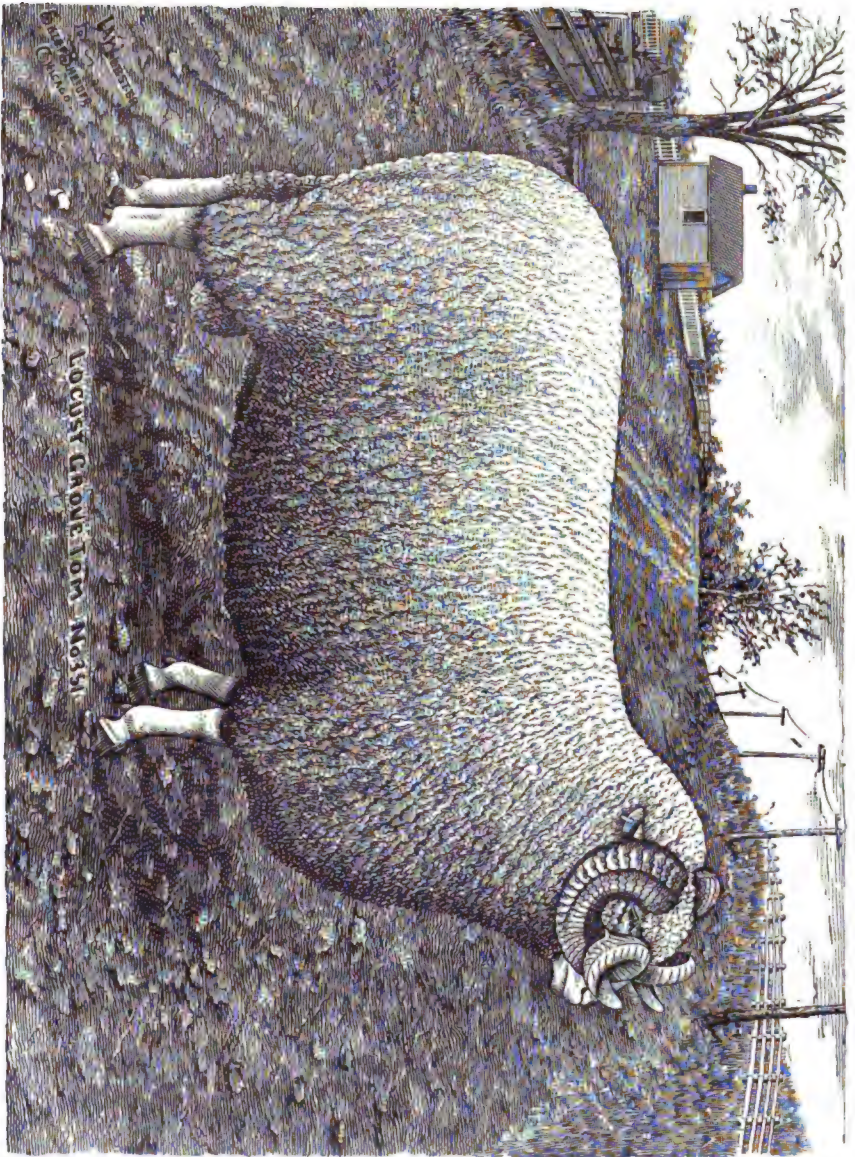
Best portrait from life, Agnes Birkman, Indiana, Pa.,.....	\$3 00
Best copy portrait, George Faint, Indiana, Pa.,.....	2 00
Best animal, Edith Young, Indiana, Pa.,.....	2 00
Best specimen, George Faint,.....	2 00
2d best specimen, Laura B. Overly, Greensburg, Pa.,.....	1 00
Best display of crayon, George Faint, Indiana, Pa.,.....	3 00
2d best display of crayon, Lizzie Pattison, Indiana, Pa.,.....	2 00
Best landscape, oil painting, Agnes Birkman,.....	2 00
2d best landscape, oil painting, Mrs. Etta Bruce,.....	1 00
Best panel, Laura B. Overly, Greensburg, Pa.,.....	2 00
2d best panel, Mabel Books, Indiana, Pa.,.....	1 00
2d best plaque, Mrs. J. G. Henry,.....	1 00
Best specimen oil painting, Agnes Birkman,.....	1 00
2d best specimen oil painting, Effie G. Overly, Greensburg, Pa.,	75
Best display oil painting, Agnes Birkman,.....	3 00
2d best display oil painting, Effie G. Overly,	2 00
Best specimen of water color, Fannie Dixon,.....	1 00
2d best specimen water color, Eleanor McGee and Edith Young,	75
Best display of water colors, Effie G. Overly,.....	2 00
2d best display of water colors, Agnes Birkman,.....	1 00

CHINA, ROYAL WORCESTER OR ANY FANCY WARE.

Best 1-2 dozen dinner plates, Effie G. Overly, Greensburg, Pa.,	\$2 00
2d best 1-2 dozen dinner plates, Laura B. Overly, Greensburg, Pa.,	1 00
Best 1-2 dozen desert plates, Eleanor McGee, Homer City, Pa.,	2 00
2d best 1-2 dozen dessert plates, Laura B. Overly,.....	1 00



IMPORTED DORSET EWE, LOCUST GROVE QUEEN, No. 665, AND RAM LAMBS,
OWNED BY JAS. L. HENDERSON & SONS.



LOCUST GROVE TOM, No. 351.—DORSET RAM.

Best bread and butter plates, Effie G. Overly,.....	2 00
Best cups and saucers, Thomas Sutton,.....	3 00
2d best cups and saucers, Effie G. Overly,	1 00
Best 1-2 dozen after-dinners, Mrs. Thomas Sutton, Indiana, Pa.,	2 00
2d best 1-2 dozen after-dinners, Effie G. Overly,.....	1 00
Best ice cream set, Effie G. Overly,	2 00
Best pitcher, Effie G. Overly,	2 00
2d best pitcher, Laura B. Overly,.....	1 00
Best vase, M. Etta Rowe, Indiana, Pa.,.....	2 00
2d best vase, Laura B. Overly,	1 00
Best dish, Laura B. Overly,	2 00
2d best dish, Mrs. Thomas Sutton,	1 00
Best jardiniere, Harriet McAnulty, Indiana, Pa.,.....	2 00
2d best jardiniere, Effie G. Overly,.....	1 00
Best display, Effie G. Overly,.....	5 00
2d best display, Mrs. Thomas Sutton,	3 00
Best pastel painting, Agnes Birkman,.....	1 00
Best pen and ink, Edith Young,	1 00

CLASS AND SCHOOL-ROOM WORK—Graded Schools.

Best specimen copied pencil drawing, Edith Young,.....	\$1 00
Best specimen pen and ink drawing, Leslie Pattison,.....	1 00
Best display of map drawing, Matthew McGee, Homer City Pa.,	2 00
Best display industrial drawing, Matthew McGee,.....	1 00
Best original design, Matthew McGee,.....	1 00

Ungraded Schools.

Best specimen pencil drawing, from life or caste, Leslie Pattison,	\$1 00
Best specimen pencil drawing, copied, Leslie Pattison,.....	1 00
Best specimen pen and ink drawing, Leslie Pattison,.....	1 00

BREAD AND CAKES.

Best loaf wheat bread, Mrs. W. T. Miller, Indiana, Pa.,.....	\$4 00
2d best loaf wheat bread, Mrs. Agnes A. Gamble, Indiana, Pa.,	2 00
3d best loaf wheat bread, Florence Lydick, Indiana, Pa.,....	1 00
Best loaf rye bread, Mrs. George Snyder, Indiana, Pa.,.....	1 00
Best six tea biscuits, Mrs. E. R. Sutton, Indiana, Pa.,.....	50
Best rusk, Mrs. J. L. Nix, Homer City, Pa.,.....	1 00
Best ginger cakes, Mrs. W. T. Miller,.....	1 00
Best cocoanut cake, Mrs. E. R. Sutton,.....	1 50
Best chocolate cake, Mrs. W. J. Short, Onberg, Pa.,.....	1 50
Best orange cake, Mrs. Silas Kinter, Home, Pa.,.....	1 50
Best marble cake, Mrs. W. T. Wilson, Indiana, Pa.,.....	1 50
Best delicate cake, Mrs. J. S. Russell, Indiana, Pa.,.....	1 50
Best lemon cake, Jennie B. Barkley, Kent, Pa.,.....	1 50
Best angel food, May Clements, Indiana, Pa.,.....	1 50
Best jelly roll, McLain Davis, Indiana, Pa.,.....	1 50

PRESERVES AND JELLIES.

Best display of preserves, Mrs. W. J. Short, Onberg, Pa.,.....	\$3 00
2d best display of preserves, Jennie B. Barclay,	2 00
Best display of jellies, Mrs. W. J. Short,.....	3 00
2d best display of jellies, Mrs. Silas Kinter,.....	2 00
Best sample grape jelly, Maggie Carson, Indiana, Pa.,.....	1 00
Best sample apple jelly, Maggie Carson,	1 00
Best sample peach jelly, Mrs. Samuel Boucher, Dixonville, Pa.,	1 00
Best sample plum jelly, Mrs. Christ. Cook, Indiana, Pa.,.....	1 00
Best sample currant jelly, Mrs. Silas Kinter, Home, Pa.,.....	1 00
Best sample raspberry jelly, Mrs. G. W. Little, Gilpin, Pa.,...	1 00
Best sample strawberry jelly, Mrs. D. W. Anthony, Parkwood, Pa.,	1 00
Best sample pear jelly, Maggie Carson,.....	1 00
Best sample, prune jelly, Mrs. John Swasy, Homer City, Pa.,.	1 00
Best sample wild plum jelly, Lydia Johnston, Crete, Pa.,....	1 00
Best sample quince jelly, Mrs. G. W. Little,.....	1 00
Best sample crabapple jelly, Mrs. J. C. Morehead,.....	1 00
Best sample blackberry jelly, Mrs. G. W. Little,.....	1 00
Best sample cherry jelly, Mrs. J. A. Simpson, Indiana, Pa.,..	1 00
Best sample elderberry jelly, Mrs. J. C. Morehead,.....	1 00
Best sample peach preserves, Mrs. Harry Bryan, Indiana, Pa.,	1 00
Best sample apple preserves, Jennie B. Barclay, Kent, Pa.,..	1 00
Best sample quince preserves, Mrs. John Swasy, Homer City, Pa.,	1 00
Best sample plum preserves, Mrs. H. Van Thompson,.....	1 00
Best sample tomato preserves, Mrs. John Swasy,.....	1 00
Best sample cherry preserves, Jennie B. Barclay,.....	1 00
Best sample pear preserves, Mrs. Harry Bryan,.....	1 00

BUTTER, PICKLES, &C.

Best 3 pounds dairy butter, Mrs. Samuel Boucher, Dixonville, Pa., the "Fair Journal," 1 year, and.....	\$3 00
2d best 3 pounds dairy butter, Mrs. W. R. Smith,.....	1 50
Best cider vinegar, Mrs. Levi Young, Indiana, Pa.,.....	50
Best maple sugar, Mrs. M. A. Wynkoop, Home, Pa.,.....	50
Best maple syrup, Mrs. Samuel Boucher,.....	50
Best display of butters, Mrs. W. J. Short, Onberg, Pa.,.....	2 00
Best pickled tomatoes, Mrs. John Swasy,.....	1 00
Best pickled mangoes, Jennie B. Barclay, Kent, Pa.,.....	1 00
Best pickled chowchow, Mrs. John Swasy,.....	1 00
Best pickled cucumber, Mrs. John Swasy,.....	1 00
Best pickled peaches, Jennie B. Barclay,.....	1 00
Best pickled nasturtiums, A. Lizzie Stewart, Indiana, Pa.,..	1 00
Best pickled pears, Mrs. Alex. Thompson,.....	1 00
Best mixed pickles, Mrs. Samuel Boucher,.....	1 00
Best catsup, Miss Jo. Agey, Indiana, Pa.,.....	1 00
Best spiced peaches, Mrs. D. W. Anthony, Parkwood, Pa.,...	1 00
Best spiced prunes, Mrs. Samuel Boucher,	1 00
Best spiced cherries, Mrs. John Swasy,.....	1 00

Best spiced plums, Mrs. Harry Bryan,.....	1 00
Best variety spiced fruit, Mrs. W. J. Short,.....	2 00
Best homemade soap, Mrs. W. A. Wynkoop,.....	1 00
Best soft soap, Mrs. Christ. Cook, Indiana, Pa.,.....	1 00
Best display of honey, Howard Bailey, Pen Run, Pa.,.....	2 00
2d best display of honey, J. L. Getty, Indiana, Pa.,.....	1 00

CLOTHS, CARPETS, YARNS, &C.

Best 10 yards rag carpet, Mrs. Geo. Snyder, Indiana, Pa.,....	\$2 00
2d best 10 yards rag carpet, Mrs. W. A. Glass,.....	1 00
Best 10 yards tow cloth, Mrs. Frank Douglas, Indiana, Pa.,..	2 00
2d best 10 yards tow cloth, Mrs. J. M. Neal, Kent, Pa.,.....	1 00
Best pound stocking yarn, Jennie B. Barclay, Kent, Pa.,.....	1 00
2d best pound stocking yarn, Mrs. M. A. Wynkoop, Home, Pa.,	50

MANUFACTURED LEATHER.

Best set of double harness, light, Godfrey Marshall, Indiana, Pa.,	Diploma
Best set of single harness, Godfrey Marshall,.....	Diploma
Best saddle and bridle, gent's, Godfrey Marshall,.....	Diploma
Best saddle and bridle, ladies', Godfrey Marshall,.....	Diploma

DOMESTIC MANUFACTURE.

Best silk quilt, Effie G. Overly, Greensburg, Pa.,.....	\$2 00
2d best silk quilt, Kate Sell, Indiana, Pa.,.....	1 00
Best delaine quilt, Mrs. Frank Douglas, Indiana, Pa.,.....	1 00
2d best delaine quilt, Mrs. Samuel Boucher, Dixonville, Pa.,..	50
Best cotton quilt, Mrs. J. R. Caldwell, Indiana, Pa.,.....	1 00
2d best cotton quilt, Mrs. J. R. Caldwell,.....	50
Best white bed spread, Mrs. Etta Bruce, Indiana, Pa.,.....	1 00
Best hearth rug, Mrs. D. W. Young, Indiana, Pa.,.....	1 00
2d best hearth rug, Annie Peckman, Elderton,.....	50
2d best handkerchief case, Mrs. Samuel Boucher,.....	25
Best sofa pillow, Mrs. Joseph Clements,.....	1 00
2d best sofa pillow, Laura B. Overly, Greensburg, Pa.,.....	50
Best pin cushion, Effie G. Overly, Greensburg, Pa.,.....	50
Best shopping bag, Mrs. T. B. Clark, Indiana, Pa.,.....	1 00
2d best shopping bag, Mrs. Joseph Clements, Indiana, Pa.,..	1 00
Best dust bag, A. Lizzie Stewart, Indiana, Pa.,.....	50
2d best laundry bag, M. Etta Rowe,	25
2d best ladies' calico wrapper, Mrs. Silas Kinter, Home, Pa.,..	1 00
Best sun bonnet, Mrs. Jos. Clements,.....	1 00
Best fire screen, Eleanor McGee, Homer City, Pa.,.....	1 00
Best kitchen apron, Jennie Lydic, Indiana, Pa.,.....	1 00
2d best kitchen apron, Mrs. Silas Kinter,	50
Best display outlining, Maggie J. Thompson, Indiana, Pa.,...	2 00
2d best display outlining, Mrs. Alex. Thompson, Indiana, Pa.,	1 00

CROCHETS.

Best shawl, Mrs. E. R. Sutton, Indiana, Pa.,.....	\$1 00
2d best shawl, Kate Christy, Indiana, Pa.,.....	50
Best sack and socks, Mrs. A. R. Sutton, Indiana, Pa.,.....	75
Best child's cap, Mrs. A. R. Sutton,.....	50
Best fascinator, Mrs. A. R. Sutton,	50
Best slippers, Laura B. Overly, Greensburg, Pa.,.....	50
Best shoulder cape, Mrs. T. B. Clark, Indiana, Pa.,.....	50
Best lace display, Jennie B. Barclay, Kent, Pa.,.....	1 00
Best knit shirt, Kate Morehead, Indiana, Pa.,.....	1 00
2d best knit shirt, Jennie B. Barclay, Kent, Pa.,.....	50
Best hand-knit silk mittens, Maggie J. Thompson, Indiana, Pa.,	75
2d best hand-knit silk mittens, Mrs. J. L. Nix, Homer City, Pa.,	50
Best hand-knit woolen mittens, Maggie J. Thompson, Indiana, Pa.,	50

EMBROIDERY.

2d best washstand set, Elizabeth D. McFadden, Indiana, Pa.,	\$0 50
Best bureau set, Elizabeth McFadden,	1 00
Best sideboard scarf, Fannie Nixon, Indiana, Pa.,.....	1 00
2d best sideboard scarf, Effie G. Overly, Greensburg, Pa.,...	50
Best pair of towels, Elizabeth G. McFadden, Indiana, Pa.,..	1 00
Best banner, Jennie Lydic, Indiana, Pa.,.....	50
2d best banner, Ella Sanford, Indiana, Pa.,.....	25
Best 6 doileys, Lizzie McFadden, Indiana, Pa.,.....	1 00
2d best 6 doileys, Laura Hassinger, Indiana, Pa.,.....	50
Best tray cloth, Lizzie Stewart,	50
2d best tray cloth, Effie G. Overly,	25
Best carver's cloth, Effie G. Overly,.....	50
Best centre cloth, Lizzie McFadden,.....	1 00
2d best centre cloth, Lizzie Stewart,.....	50
Best tea-table cloth, Laura B. Overly, Greensburg, Pa.,.....	1 00
2d best tea-table cloth, Mrs. Mary Rice, Indiana, Pa.,.....	50
Best cake doiley, May Clements, Indiana, Pa.,.....	50
2d best cake doiley, Mrs. T. B. Clark,.....	25
Best Roman embroidery, Lizzie Stewart,	75
2d best Roman embroidery, Fannie Nixon, Indiana, Pa.,.....	50
Best rococo embroidery, Mrs. Joseph Clements,.....	75
Best display embroidery, Laura B. Overly,.....	2 00
2d best display embroidery, Lizzie McFadden, Indiana, Pa.,..	1 00

DRAWN WORK.

Best ladies' apron, A. Lizzie Stewart, Indiana, Pa.,.....	\$1 00
2d best ladies' apron, Agnes Birkman, Indiana, Pa.,.....	50
Best bureau scarf, Agnes Birkman,.....	1 00
2d best bureau scarf, Mrs. Horace Lowry, Indiana, Pa.,.....	50
Best sideboard scarf, Emily Stoneback, Black Lick, Pa.,.....	1 00
2d best sideboard scarf, Agnes Birkman, Indiana, Pa.,.....	50

Best cake doiley, Emily Stoneback,.....	75
2d best cake doiley, May Clements, Indiana, Pa.,.....	50
Best 6 doileys, Emily Stoneback,.....	1 00
2d best 6 doileys, Laura B. Overly, Greensburg, Pa.,.....	50
Best centre cloth, Fannie Nixon, Indiana, Pa.,.....	1 00
Best display, Emily Stoneback, Black Lick, Pa.,.....	2 00

Miscellaneous articles deemed worthy of premiums by the judges, but not yet passed upon by the board:

Bread purse, A. Lizzie Stewart, Indiana, Pa.
 Beil case, Elizabeth McFadden, Indiana, Pa.
 Bonbon box, Mrs. Thomas Sutton, Indiana, Pa.
 Wild gooseberry jelly, Mrs. Samuel Boucher, Dixonville, Pa.
 Piccalilli, Mrs. Samuel Boucher.
 Peach tomatoes, Mrs. Etta Bruce, Indiana, Pa.
 Evaporated dried fruit, S. M. Morehead, Indiana, Pa.
 Display sewing machine work, Kate Morehead, Indiana, Pa.
 White Niagara grapes, Mrs. T. B. Clark, Indiana, Pa.
 Bread plate, decorated, Mrs. Horace Lowry, Indiana, Pa.
 Basket of prunes, J. M. Beer, Indiana, Pa.
 Peck of white onions, Mrs. Geo. Snyder, Indiana, Pa.
 Peck of yellow onions, Mrs. George Snyder.
 Canned cherries, Edith Depp, Smathers, Pa.
 Wild-goose plum preserves, Mrs. H. Van Thompson, Indiana, Pa.
 Goose plum jelly, Mrs. H. Van Thompson.
 Duchess pears, Mrs. Christ. Cook, Indiana, Pa.
 Peck of red onions, Mrs. Christ. Cook.
 Display of cakes, McLain Davis, Indiana, Pa.
 Machine-knit socks, Kate Morehead.
 Machine-knit stockings, Kate Morehead.
 Hand-knit bureau scarf, Kate Morehead.
 Spring barley, S. F. Weller, Rehoboth, Ohio.
 Evaporated fruit, Kate Morehead, Indiana, Pa.





PENNSYLVANIA STATE DAIRYMEN'S ASSOCIATION HALL, MEADVILLE, PA.

REPORT

OF THE

Pennsylvania State Dairymen's Association,

1893.

LIST OF OFFICERS.

President.

John C. McClintock, Meadville, Pa.

Executive Committee.

Hon. J. C. Sibley, First Vice President, Franklin, Pa.

J. B. Phelps, Second Vice President, Conneautville, Pa.

George M. Orris, Third Vice President, Meadville, Pa.

Secretary.

George H. St. John, Meadville, Pa.

Treasurer.

W. W. Dean, Meadville, Pa.

Vice Presidents.

D. H. Lefever, Crawford county.

H. C. Crawford, Venango county.

A. L. Wales, Erie county.

John S. Kean, Crawford county.

E. E. Critchfield, Westmoreland county.

W. T. Everson, Erie county.

R. L. Cochran, Venango county.

Leonard Rhone, Centre county.

F. J. Forker, Mercer county.

T. J. Mellinger, Lancaster county.

Thomas Magee, Center county.

R. S. Caldwell, Washington county.

Joseph Gillingham, Montgomery county.

J. M. Shields, Jefferson county.

R. S. Hartley, Warren county.

W. W. Phillips, Erie county.



PENNSYLVANIA STATE DAIRYMEN'S ASSOCIATION HALL, MEADVILLE, PA.

REPORT
OF THE
Pennsylvania State Dairymen's Association
1893

LIST OF OFFICERS

President,
John C. McClintock, Mendota, Pa.

Executive Committee,
Hon. J. C. Sibley, First Vice-President, Franklin, Pa.
J. B. Phelps, Second Vice-President, Chambersburg, Pa.
George M. Orris, Third Vice-President, South Hill, Pa.

Secretary,
George H. St. John, Mendota, Pa.

Treasurer,
W. W. Dean, Mendota, Pa.

Vice Presidents,
D. H. Lefever, Crawford County
H. C. Crawford, Venango County
A. L. Wales, Erie County
John S. Kean, Crawford County
E. E. Critchfield, Washington County
W. T. Everson, Erie County
R. L. Cochran, Venango County
Leonard Rhode, Centre County
P. J. Forster, McKean County

NINETEENTH ANNUAL MEETING
OF THE
Pennsylvania State Dairymen's Association.

Held at Library Hall, Meadville, Pa., on February 1, 2, and 3, 1893.

The meeting was called to order at 2 P. M., with President John C. McClintock in the chair.

Organization was effected by the appointment of the following committees:

Committee on Resolutions—D. H. Lefever, Hayfield, Pa.; E. S. Crooker, Union City, Pa.; A. L. Wales, Corry, Pa.

Committee on Intelligence—L. C. Magaw, Meadville, Pa.; J. B. Phelps, Conneautville, Pa.; George Spitler, Mosiertown, Pa.

Committee on Nominations—George M. Orris, Meadville, Pa.; L. A. Tucker, Drake's Mills, Pa.; S. N. Chase, Meadville, Pa.

Committee on Membership and Finance—T. M. McKinney, Meadville, Pa.; A. J. Weller, Meadville, Pa.; John S. Kean, Conneaut Lake, Pa.

Committee on Audit of Accounts—C. H. Blystone, Meadville, Pa.; John Fox, Meadville, Pa.

Committee on Dairy Utensils—C. W. Heydrick, Meadville, Pa.; E. W. Shippen, Meadville, Pa.

The report of the treasurer was then submitted by W. W. Dean, as follows:

TREASURER'S REPORT.

Meadville, Pa., Feb. 1st, 1893.

Mr. President, and Members of the Association—I present the following as my account with your society:

Dr.

To balance in treasury,	\$377 00
Amount received from secretary,	350 00
Membership fees,	4 00
Over amount paid by error,	2 00

Total, \$733 00

Cr.

By sundry bills, as per vouchers, \$390 79

Balance on hand February 1, 1893, \$342 21
(Signed) W. W. DEAN.

REPORT OF SECRETARY.

Mr. President and Members of this Association:

Owing to the illness of your secretary during your last session, L. A. Tucker was appointed to perform the duties pertaining to that office. The regular programme was rendered, with the few modifications which became necessary. The attendance was good, and the interest most marked. The experiment of giving our ladies a prominent place in our proceedings succeeded beyond expectation. They not only proved their interest in the work of the association, but they proved that they could give the "lords of creation" some points in husbandry that are practical. Their presence in goodly numbers lent a refinement to the proceedings that such meetings too often lack.

The finances of the association have been somewhat reduced from last session. The total resources at our command amount to \$342.21.

As to the work accomplished by the association during the past year, it has been confined to the work of stimulating the dairy industry in our midst by comparison of experience of members, and the instruction gained from scientific lecturers and experimenters. It must be acknowledged that dairy methods have not marked the changes indicated by the general progress of other industries around us, and in our midst. We have been left by the wayside, comparatively. Our peculiar situation plainly demands co-operation of the most thorough character—a practical working together to a common end. We forget that the age of healthy competition is past, and that we are drifting on a flood tide of capitalistic combination, above whose rush and roar we might, if we would, hear the voice of wisdom whisper "combine or perish." We mean a practical combination of effort and resource to produce the largest quantity of the best quality of the most salable product possible to produce, and then go into the market and demand our exclusive right to sell butter and cheese as such, without competition with a disguised and illicit production from the baser elements of the bovine carcass. This right the law now vouchsafes us, but it will be attacked in the legislature, and nothing but vigilance and prompt action can maintain this bulwark of protection. If the enemies of the oleomargarine law succeed in obtaining its repeal, we, as

well as butter consumers, will be left at the mercy of an unscrupulous band of food adulterators and counterfeiters. It may, even now, be too late to successfully defend ourselves. The enemy are already in the field with a strong lobby, and attacking the very citadel of our safety. We cannot afford to lose the vantage ground we have already gained and permit the city members of our legislature to so disregard the interests of agriculture and pure food as to open the doors to an avalanche of bogus butter.

The silo has passed the ordeal of another year, and the comparison of experience here will show the result. It is a subject of too much importance to be passed over lightly. Of course, mistakes have been made, and they all tend to prejudice the popular mind against the comparatively new forage. It is possible that its merits have been magnified by the utterances and statements of silo enthusiasts; and again it is possible that the intrinsic value of silage is not popularly appreciated. In view of these facts, your committee felt that the subject of dairy foods should occupy a prominent place in our programme, and we have, accordingly, made it the leading topic of this meeting. The subject of dairy education has also received due prominence. We trust that we have not erred in judgment in thus laying out our work. We have secured the best lecturers possible, from the east and the west, as well as the best talent in our own State, to lead in the discussion of these subjects. Let us draw aside the blinds of prejudice and indifference and let in the sunlight of truth, that our dairy industry may be made a pleasure and profit. Colorado has its silver, and California has its gold, but old Pennsylvania has the soil, the sunshine, the grass and the water from which we can draw a product that will make these proud sisters of the west glad to lay their treasures at our feet in exchange. Let us force the issue.

Concerning the exhibit of dairy products at the World's Fair, we can only say that we have received a communication from Executive Commissioner Farquhar, of our State, asking for information regarding it and efforts in that direction by dairymen. We are forced to deny any knowledge of such a movement in this section, or any other part of the State. We shall be glad of any information that individual members may be able to impart to us to aid him in his work.

As to the subject of securing an increase of funds for carrying on the work of the association, we are of the opinion that an act to appropriate an amount sufficient to print in pamphlet form and publish the report of our proceedings within thirty days after the close of our meeting, would be constitutional, and might be secured by proper effort. Beyond this, we can expect nothing from the State.

The reports for 1891 have been distributed as far as possible, and copies are reserved for members who have not yet received them. We shall be glad to distribute them here. The report for 1892 is in the hands of the State Printer, and will doubtless soon be ready for distribution. All of which is respectfully submitted,

G. H. St. JOHN,
Secretary.

PRESIDENT'S ADDRESS.

Gentlemen and Ladies of the Pennsylvania State Dairymen's Association, Fellow Dairymen, and Farmers:

As President of this Association, I heartily welcome you all to our nineteenth annual session, and I shall be very brief in my address, as we have with us on this occasion some of the brightest lights in the dairy world to occupy the time, and it would be only natural that you should prefer to listen to them.

As we are assembled here to discuss the various topics connected with the dairy and farm, and to seek the best methods of advancing and improving the condition of the dairyman and farmer, permit me to ask you, fellow dairymen, what progress you have made since our last meeting, one year ago? Are you keeping up with the dairy procession of the times, or are you falling behind in the march of the great dairy army? I do not want gentlemen present to be backward in asking questions, or helping to make this one of the best and most instructive conventions we have ever held. And how does our State rank in dairy statistics with others in the great dairy industry? I think we rank fourth in the butter and cheese productions with other states, if I am not mistaken, in the dairy reports; and yet our dairy committee, appointed to represent the State's interest at the World's Columbian Exposition, tells us that we are not a dairy state, and not entitled to any of the appropriation set apart to represent our products at the great fair. Now, gentlemen, is this just? Are we not entitled to a full representation of our products with other states? Let me ask you why we should not rank first in the production of butter and cheese? Is it because we lack the ability and energy to head this great dairy procession? I say no. Our discussions at this meeting will involve the important question of how to accomplish this, and the means to bring about the desired end.

The chief point we have for consideration is the gigantic combination fraud oleomargarine, which is sapping the vitality from the dairy industry of our country, and if we expect to cope with this great anaconda, which is wrapping its huge coils around every dairyman and farmer in the land, we must be up and battle for our rights, or it will crush us without mercy. Why, not later than a few days ago, I read an account of Uncle Sam's buying some forty thousand pounds of the vile stuff called butterine to feed the brave soldiers at the State Home in Ohio. If this is true, what an outrage is this upon the men who periled life and limb for their country! Surely, do not they deserve the best butter in the country? Is it not high time, fellow dairymen, that we rise up in open battle for our rights against such frauds? Permit me to ask you what you have done in the fight with this great monopoly? Why cannot the members of this association join forces with the National Dairymen's Protective Association, of the eastern part of the State, to help them in this great battle for the rights of every dairyman in the State and country?

They have petitions in every part of the State, praying for the Sen-

ate and House of Representatives to enact a law creating the office of State Dairy and Food Commissioner, to protect all food products from adulteration. See that every dairyman and farmer signs these petitions, and write to your representatives from your districts, insisting that they use their efforts and influence in favor of such a law. In the past year it has cost the state of New York over \$100,000; Ohio, \$25,000, and New Jersey over \$10,000, to protect their food from adulteration. And why should not Pennsylvania protect her dairy interests, as it would benefit every lover and consumer of butter and cheese in this great Commonwealth?

We have another important bill before the House of Representatives at Washington, known as the Hatch bill, in relation to the original packages of oleomargarine; and unless this becomes a law, the dairy industry in many of our states will suffer great injury, if not entire destruction. Let every member of this association write to his honorable member of Congress, urging upon him the necessity of the passage of this bill, if he has not already done so.

In conclusion, I again call your attention to the subject of the appropriation for carrying on the work of this association. I think we should be able to devise some means to increase it, during the present session. The benefit to dairy interests would be incalculable. It is impossible to secure the best results with present funds.

Finally, let me urge every farmer and dairyman present to use every means at his command to improve his dairy and farm. Though the outlook is not bright, though our work may seem to be arduous and costly for the returns, yet the reward is sure. Let us place our grand old Keystone State in the front rank of butter and cheese production in this country.

At the close of the president's address, the regular speaker not having arrived, the discussion of the address, and kindred topics, was taken up. Hon. J. C. Sibley, ex-president of the association, being present, was invited to open the discussion. He spoke as follows:

ADDRESS OF HON. J. C. SIBLEY.

Mr. President, Ladies and Gentlemen:

I do not know that I have anything of interest to add to what your president has written and delivered to you. We all feel, I think, a growing sense of indignation at the injustice that has so long been perpetrated upon the dairy interests of this Commonwealth. I believe that there is no criticism that can be made upon the action of any committees that have been appointed to secure larger appropriations from the State for carrying on our dairy work. I believe that your various officials and your various committees have, at all times, performed their duties with fidelity; and still in some way, we have failed to make the influence and the power of the agriculturists felt upon our legislative bodies, not alone in the direction of the dairy interests, but in reference to your finances, in reference to your associations, in reference to a multiplicity of things of vast interest to dairymen in their dairy conventions, and in their relation to the other great interests of this Commonwealth. I wonder that your president did not call attention to an opinion delivered by a judge

of Pittsburgh, which is one of the most remarkable judicial opinions that I have ever read. One hundred different men had been convicted of deliberate and wilful violation of the Pennsylvania statute law. They had been defended by the best talent; they had abundant resources at their back; yet the violation of the law was so plain that they were convicted. I believe that, in the majority of instances, those fines, which were the minimum that could be imposed under the law, were suspended, and then the learned judge stands up and denounces the oleomargarine bill as unconstitutional. If it is not good legislation it should be wiped off the statute books; but while it is standing there, courts should not wink at nor invite its violation.

We are inclined to think that our law-makers and judges occupy a higher realm than the citizens of the community at large, but I do not think it is unbecoming in us to criticise the action of that court, when that individual has already criticised two higher courts than his. He had criticised Congress and the Senate; he had criticised the President of the United States who signed the bill, and both branches of the State legislature; he criticised also, the Governor who signed it, and furthermore, criticised the Supreme Court of the State of Pennsylvania, that had affirmed the constitutionality of the measure. By that act he sank in the respect I had entertained for him, and I do not want to say just how little respect I entertain for a judge of that character. I may sometime be arraigned for contempt of court, but courts are mere human institutions of our own creation, and when we have created a bad work, or installed a poor workman, we ought to be ashamed thereof and hold it in contempt. When judges will pander to the powerful, when they become the tools of the rich, when they are merely creatures of corporations and organized rings, when they are deaf to the cries of the weak and defenceless, and forget mercy, it is time for their impeachment and overthrow. As dairymen, we may not know much about law, but we do know justice, and have not, I trust, lost all common sense. Encouraged by the extra-judicial delivery of this man—backed by all the power and influence of the men who are running fast freight trains through here loaded with creamery (?) butter, made from the vilest offal gathered from the streets of Chicago—lobbyists are before your legislature to-day, seeking the repeal of that state legislation affecting this product, and at Washington, seeking the repeal of that same legislation. We submit to this because we are politicians, maybe; and maybe it is because we are not politicians enough. I think there are enough honest members of the legislature, that if you make them know, if you Republicans make the members from your counties know that there is an injustice in this proposed legislation that affects forty-four per cent. of the population of Pennsylvania, they will listen to you, rather than to the rings of the Dressed Beef and Butter Combine. I was in Harrisburg last week, in attendance upon the meeting of the State Board of Agriculture. They had a good meeting, and I had a seat up in front where I could look into the faces of that audience; that good, representative body of men who were in attendance at that meeting. I had been, a day or two before, over in the legislative halls of our Commonwealth, and had seen the Pennsylvania State legislature, and, as I compared the two bodies of men, the comparison did infinite credit to the farm-

ers; and yet they were debating the advisability of asking for an appropriation of \$20,000 to carry on State agricultural and institute work. Farmers stood up there and said, "We had good institutes last winter; our people were interested, and we had much valuable information given us, but we don't have money enough to carry on the work, and we found we were short \$50, and a few of us got together and paid it out of our own pockets, and we are going to go on and do it again."

I think they ought to have that \$20,000, and supposed, of course, it would pass that body; whether it would get through the legislature or not is a different question; but I found one reason why it will never go through the legislature. One gentleman got up and said: "For the merits of the appropriation, and the good it could accomplish, we are asking altogether too much for this work. If we ask so much without showing that we can spend it properly, the appropriation committee would cut us down so low that we could not have as much as we have to-day." And that opinion was shared by a gentleman here, and back there, and over yonder, until they succeeded in talking themselves out of \$10,000. They were too modest; that was all that ailed them. They were not as one man demanding it, or they would have gotten the \$20,000. For any object that has a little political influence to back it, \$40,000, or \$50,000, or \$90,000 can be secured; and yet the farmers of Pennsylvania are afraid to ask for \$20,000. I don't wonder that the Dressed Beef Combine and the Oleomargarine Combine send men to Harrisburg to urge the repeal of our oleomargarine laws in this State. Let every representative in this association from different counties write to the members of the legislature from his district, and get your fellow agriculturists to write to them, that no such repeal will be tolerated by the people of the community which they represent. I greatly fear that the repeal bill will be passed, because they will make the legislature believe popular sentiment demands it. They will charter a few train loads of workingmen (boards of trade workingmen), to go down to Harrisburg and tell how cheap they can buy oleomargarine, and how good it is, and how dear butter is. They have the influence and the great degree of power that the wealth accumulated by these unholy means affords, and only through the most watchful vigilance will we prevent the repeal of the oleomargarine law.

Instead of its repeal we should demand the appointment of State commissioners charged with the duty of securing pure food products for the people. I have never seen a lobby of farmers, either in Washington or Harrisburg. There was a distinguished looking gentleman down at Harrisburg, and I inquired, "What is that gentleman's business?" The answer was, "He is a representative of the railroad interests; the one that gives out the passes. When any of the members want to bring their families down to spend a week or two at the capital, he is the man they apply to for passes. He has been here nineteen years looking after their interests."

Well, then I did not wonder so much when, a little further along in the proceedings of the State Board of Agriculture, I heard an address on our State fence laws. It was an instructive address, giving the law in regard to it from the earliest times down, and explaining its relation to the community. Incidentally came up the question of rail-

road fence law. The speaker explained how two owners of adjacent cleared lands, must each maintain one-half of the boundary fence. Then he came to the railroad fences and said, "In this State the owner of the land must maintain the railroad fences; that is the universal decision of our courts. It has been the universal ruling. The Supreme Court has invariably ruled that in the absence of a contract existing or produced, that it is presumptive evidence that it is the duty of the land owner to maintain that fence, rather than the railroad company." I thought that was singular; and, although I was not a member of the State Board, I asked him if he would explain to me why our Supreme Court (and in some things they are not very supreme), when it came to a question of presumption, always rule in favor of a corporation?

When a railroad runs through a man's land, is the company not responsible for one-half the fence? Do not the corporations own the adjoining land? Why should there not be a presumption, at least, that they should maintain one-half the fence? Why should that decision in the State of Pennsylvania be in almost direct opposition to the presumption in the State of New York, and every other State in the Union, that railroads could not get their right of way through those farms until they had in every instance agreed to maintain the fences? In the State of Pennsylvania the Supreme Court decides that the presumptive evidence is in favor of the corporation, and against the private land owner. I do not know that I got any satisfactory answer as to why the railroad company should be favored exclusively, or why it should not be compelled to maintain half of that fence. It was held before that railroad went through the land, it must have given that man some satisfactory compensation, and he agreed to maintain the fences adjoining railroad properties. I do not know how it comes; I think it is because you do not elect your Supreme Court judges. I believe courts are sometimes political machines, just as much as when in other walks of life; because I saw a Supreme Court of the United States once decide, by a vote of eight to seven, that one man was legally elected President of the United States. Was it not singular that in a court composed of Republicans and Democrats that the Republicans should find justice all on one side, and the Democrats on the other. Even in the higher judicial bodies of the United States we find political judges.

Question. Do the railroad companies pay any taxes in this State for the land they occupy?

Mr. Sibley. If they do I do not know it.

Question. Why?

Mr. Sibley. Because for forty years you have been voting for party, not for men.

I cannot comprehend how we, as good citizens, sharing equally the blessings and burdens of government; we, who should have a common interest in the glory and prosperity of the nation, can so at times exalt our partisanship and debase our patriotism, as to be led to the support of men and measures in direct opposition to the welfare of our homes and our country. Instead of the farmers being the leaders and moulders of parties and policies, they have unconsciously been only the instrument in the hands of those who have well nigh worked

their ruin. They have been the camp followers, when they might have been the generals. They have accepted conditions when they might have dictated treaties. In all matters involving our interests, we must be units, not fractions.

The history of all nations of past ages has proven that when agriculture ceased to be the directing and dominating force in government, that nation soon perished. The farmers know their rights, but in the past have been too modest to assert them. If you do not do so soon you will be too poor to assert them. The farmers have no quarrels with corporations. We do not envy them their success. We realize that the prosperity of one should be the prosperity of all in this nation, who, by sturdy effort, contribute to her wealth and greatness. We merely wish to give notice that one man's or one corporate right leaves off at the point where another man's right begins. They secure their rights because of organization. By acting as a unit they sometimes secure not only their own rights, but part of yours. Your remedy is only along the same line—that of organization. We, as farmers, must act as one man in rebuke of wrong, even if that wrong is done to another, and not to ourselves. Our great American poet says:

“He's true to God who's true to man.

Wherever wrong is done, to the humblest and the weakest

'Neath the all-beholding sun,

That wrong is done to all of us,

And they are slaves most base,

Whose love of right is for themselves, and not for all the race.”

We have no quarrels with judges or courts. We only ask that they turn occasionally from the law as laid down by some weak man, to that law which is laid down by Almighty God in the Book of the Law. We ask them that they permit not the bandage to fall from the eyes of justice, but, with her hoodwink closely drawn, hold her scales and her unsheathed sword, knowing not whether the man be rich or poor, weak or powerful, but knowing only the verities of eternal truth, weigh out to each his equal portion. We demand no more, and, in the language of Andrew Jackson, “By the Eternal,” we will take no less.

Sink your jealousies, broaden your charities, stand by your brother dairyman and farmer, and realize that it was intended in the formation of this government the people should be sovereigns, and your public officials only the servants to execute your sovereign will.

A member. Are they exempt from fencing their lines through the farms through which they pass?

Mr. Sibley. I don't think the lawyers think they are exempt. Section IV, art. 17, of the United States, stands as a dead letter. We want a law making that clause and section binding upon the corporations. Any violation of this article of the Constitution should subject the offender to fine and imprisonment. I suggest to Senator Logan that the legislature go one step farther, and say that after due notice to the stockholders to fill such contracts, failure to do so shall work forfeiture of the charter of such corporation. When the legislature enacts such a clause you will have a remedy for the injustice of which you complain.

John Fox. If any of Mr. McClintock's cows, or my cows get on the track and cause a wreck, can the railroad company collect damages from the owner of the cattle?

Mr. Sibley. Judge Stranahan held to the opinion that the owner of the cow would be held responsible in such cases.

A member. You mean in Crawford county courts.

Mr. Sibley. I mean in most courts, as they are constituted to-day. Judge Stranahan said the owner must be held responsible, and he gave a very fair and masterly interpretation of the law, but it made the blood of a good many men tingle when they realized the true situation.

Then there is the matter of a pure food commissioner; we have had that subject up before each committee for a number of years, and we are told that it is a great absurdity; that the Constitution does not provide for a pure food commissioner, as it increases the number of office holders. It is wonderful what sticklers for the Constitution and the right some of our lawmakers are. The corporations have their lobbyists there working in their interests, and the farmers ought to send their lobbyists down there, too. I don't think we will get it this year, or next, but we must insist on it, just the same. I see that Colonel Strohecker is here, and you will all enjoy listening to him.

T. J. Brush. I am not ready to leave this subject yet. I have a neighbor that is paying county and township tax upon the very land taken by the railroad out of his farm. I think these inequalities should be remedied.

President McClintock. If he is paying tax on the land the railroad company owns, he had better turn the tax over to the company; they have a way to get along with such things better than he can. But I see that Professor J. H. Monrad, of Illinois has arrived, and we shall be pleased to hear from him.

Mr. Monrad. It is not quite fair to call on me, I think, for I have not got acquainted with Pennsylvania dairymen, yet. I am pleased to see so many present, and to notice a fair sprinkling of ladies among us, but I would like to see more young men here. We must look to the younger generation for the improvement of the dairy. I was highly astonished to hear the statement that it was unconstitutional in your State to have a pure food commissioner. It goes beyond my reasoning, but I suppose it is so. However, I would like, right here, Mr. President, to call your attention to one thing with reference to getting a pure food commissioner. If the dairymen of Pennsylvania will lay more stress on getting a dairy commissioner, who will look after the dairymen and clean their houses first, before accusing the people, they will have better success. I am ignorant of Pennsylvania dairymen, but I can speak for eight states where I am acquainted. The best pure food commissioners I have seen attended to that matter first. This officer visits each factory and creamery to see if there is any watering or skimming, or uncleanness of utensils. There are sometimes things lurking in the corners and out-of-the-way places that are not only filthy, but breeding places for disease and death. If you demand a food commissioner to do that kind of work, you should have no difficulty in getting him. We have not been able to get one in Illinois because it has been found out that we want one to

fight the oleomargarine. A great many breeders who are breeding fat stock have a firm belief that it is to their interest to have oleomargarine manufactured and sold.

Having just come in, I should rather listen to what you have to say than to extend my remarks further at this point.

President McClintock. The question is open for general discussion now. We shall be glad to hear from any gentleman on the subject of oleomargarine, or that of food commissioner.

T. J. Brush. Is there not a bill introduced in the legislature to repeal the present oleomargarine law?

President McClintock. I believe there is, but what form it is in I cannot say. Our attorneys of the National Protective Dairymen's Association are there in opposition to it; also, representatives of the Grange are there to prevent repeal. We must use our own power here to assist them with our petitions and letters to our legislators if we do not want that bill repealed. As Mr. Sibley says, we must send in our lobbyists to work for us. If we should send down a good delegation from this county, it would have a good influence there. We have shown some of our work already.

Benjamin Culp. I would like to mention one thing. Why cannot we combine and send men to make our laws who will do what we want? We have certain rights that ought to be respected, and yet we, ourselves, are to blame because we don't send men to the legislature that will look after our interests. How many farmers have we in the legislature? Very few, I dare say. Why are we divided and subdivided? Why not unite and send men who will defend us and be true to our interests? I was indignant while listening to the facts that have been told us. Who is to blame? Nobody but ourselves. We need men that will look after our interests. I hope you will throw all party prejudice away and combine for this one great thing. I have said I am glad my farm lies a quarter of a mile from the railroad. I could not sleep if the railroad ran through my farm. If my cattle should stray out on the track and cause a wreck, the company would sell me out of house and home for damages. We must combine. I can't see for my life why the farmers of Crawford county should be divided on these vital questions.

Secretary St. John. I should like to ask Mr. Culp how he is going to get legislation favorable to farmers from members from Philadelphia and Pittsburg. The man who has introduced the bill for the repeal of the oleomargarine law is fresh from Pittsburgh, where there exists a court that lately imposed fines to the amount of thirty thousand dollars at a single sitting, on dealers who defied the law. And yet the judge who tried them declared that the law was burdensome, and should be repealed, really condoning the offence of wholesale violators of the law.

John Fox. If we should send a farmer down to Harrisburg to make laws for us they would say "He's only a buckwheat from the rural districts; he doesn't amount to anything."

Benjamin Culp. Could not the rural districts outnumber the members from the cities if they were combined?

President McClintock. We should like to hear from Mr. Magaw on this subject, and his opinion of the effect of oleomargarine on the dairy.

L. C. Magaw. I am opposed to it. I think you are reaching out too far. I have seen much oleomargarine that is better than a large amount of the dairy butter offered for sale to-day. One party gets 15 to 18 cents for his butter because it is not good; another party—McClintock, for example—gets 35 cents because he has good butter, and a good market for it. I have handled cheese and butter in this section for a great many years, and know what it is like; and when I attend a meeting of this kind I feel a little sad, because, since the organization of the Dairymen's Association, there has been so little improvement made in the quality of our butter and cheese. There is hardly one particle of improvement in cheese to-day over that of fifteen years ago, notwithstanding the meetings of dairymen from year to year. Crawford county is capable of producing just as good cheese and butter as can be produced in the United States, and can realize just as much money from them. We do it to a very small extent.

John S. Kean. As Mr. Magaw has said that, notwithstanding all the effort that has been put forth for the improvement of the dairy product of this section, there is no perceptible result for the better, I would like to ask him to suggest some plan to secure that result. We are here to learn, and he is capable of making some practical suggestion in that direction.

Mr. Magaw. I would say, commence with the boy that drives the cow. Keep the dog at home unless he is trained to the business. The milk is to be taken to the factory to be made into cheese, for instance. Now, no factory can succeed unless everyone connected with it, from the boy that drives the cow, to the man who sells the product, performs his work properly. I do not care how good a man you have in the factory, unless he has the right raw material, and proper conditions, it is beyond his power to produce a good article.

Then, on the other hand, the dairyman must perform his part right. If each one has done his duty properly, from the driving of the cows until the milk comes to the factory, and the conditions are not right there, failure to produce a good article will be the result. It is a great misfortune that Crawford county fails to produce an article that is capable of bringing into this section of the country thousands of dollars more than we receive. The cheese from this section are considered a second rate grade of cheese. They do not come up to the cheese of Herkimer county, New York state. The Canada cheese far outreach us, and the western country goes ahead of us. The Canadians have an inspector who goes from factory to factory, having oversight of a certain number of them, and seeing whatever is wrong. If the milk is brought in in bad condition, it is sent back. Thousands of cheese are lost in Crawford county for lack of this care. If we go to Sherman, in the state of New York, we will find in one factory 14,000 to 18,000 pounds of milk brought each morning, the cream of which goes into butter. One month after all of our factories had closed I received an order from the west for 2,000 boxes of cheese. I went to New York state and got them. I there visited five factories that worked a month after we had quit. The proprietor said, "On the seventh of March we will start again." We do not start until about the seventh of May, to our own great loss. Why is it? I don't know why the farmers do not wake up to their interests. I am op-

posed to the manufacture of oleomargarine, but I don't believe it is made from as vile stuff as you imagine. A commission merchant of New York said to me, "It is made of the vilest stuff that can be found." I said, "No, it is not." I am sorry it is made, because it affects the price of our butter, which should be made of cream alone. There are tons of butter made in this very county and brought to the merchant, who pays 10, 12 or 15 cents a pound for it, and handles it at a loss which could, by proper care, bring 35 cents a pound, the price of creamery butter. The fault lies with the dairyman himself. The fact is, during the last ten years there has been no improvement whatever in the product of cheese; in butter there is a little improvement. Creameries have been established here and there, and they demand a higher price. The great trouble is, in my opinion, the want of intellect, the want of intelligence, in the community.

Mr. Howard. I would like to make a little correction. If I understand Mr. Magaw, he says there has been no improvement made in the price and quality of cheese during the past ten years. I wish to state that I know that to be a positive mistake. In order that our western friends may not think that Crawford county is so far behind, let me tell you of a little factory in the western part of Crawford county, running four years, made 111,000 pounds of cheese, and every pound sold for as much as the highest New York cheese, and a good portion of it sold from one-half to one cent higher than the highest New York quotations. These are figures which I can prove. There may be cases in the county where there has not been the least particle of improvement made in the last fifteen or twenty years, but I know of this one where there has been improvement, and if other factories will take a little more interest in the work in the factory, and on the farm, producing a good article for the factoryman to work on, there is no question but that Crawford county can make as fine an article as can be found in the state of New York.

Mr. Magaw. I know a factory that made cheese fifteen years ago that sold for as high a price as my friend mentions. You will find that very factory in this section of the country, but it is not producing as good cheese now as it did then. A good article can be produced if the proper pains is taken, from the boy that drives the cow, to the man who sells the product. Take it all in all, there is no improvement.

Mr. Martin. I think I agree with Mr. Magaw. I agree with him that we do not get the money out of our dairy products that we ought to get. We don't make as much as we ought to make. It is a fact that there are plenty of cheese produced in Crawford county that can be sold at the factory for within three-quarters of a cent, or a little less, of the quotations of the New York market. What I do not understand is, if we don't get as much as the New York markets do, is there some market from which we do not get quotations? We have no trouble to get within a quarter of a cent of the highest quotations given in New York.

Mr. Price. We make no improvement because we want to take the cream off. We want to make two articles of the same material. One difficulty is the soft cheese. As Prof. Robertson said while here. "Crawford county people want to make their cheese one day and sell

it the next." I would like to ask if we could not be protected by printing our goods?

Mr. Magaw. He has a factory that started out to make full cream cheese. When I found that they were making butter from the night's cream I declined to buy a single cheese.

Mr. Monrad. I think the gentleman struck the right note, and I am glad to say that the shot did not strike me. I think, though, that it would hit many of our dealers. When they buy cheese from the different factories, they will go around and pay about the same price for skimmed cheese as for full cream, and I think these dealers should be severely criticised for so doing. I am glad Mr. Magaw does not encourage that. We have heard it acknowledged that the improvement of your butter is greater, comparatively, than the improvement in your cheese. This is because the dealers have stepped out of the old rut. They say to one lady, "That butter is not worth more than ten cents," and will pay twenty cents for another batch of butter. We must get our dealers to discriminate and pay only what an article is worth. But here is a dealer that is selling other goods. He knows that if Mrs. Jones finds out that Mrs. Smith has received two cents more a pound for her butter, Mrs. Jones will buy her goods elsewhere. Hence, I say that dealers have got to do the educating for further improvement of factory cheese. If the dealers will discriminate, I think the rest will come to pass.

Mr. McClintock. Mr. Magaw said that oleomargarine had but little to do with the prices of good butter, but I notice that whenever we return a batch of those dealers in Pittsburgh who sell oleomargarine, creamery butter advances one or two cents a pound, and when oleo regains sway, the creamery butter tumbles accordingly. Most of the dealers in Pittsburgh handle oleomargarine. I have been fighting that thing for years for just what it is, and I shall continue the fight. If they sell it for oleomargarine, and don't deceive the people, I have nothing to say; but I want it colored and put on the market for just what it is, and sold for that. Whenever they do that we can reap the benefit of our pure butter. Again, you must build up a trade before you can get a better price for your butter. I command about two cents a pound over creamery prices, and take the run of the market. Whenever we return the spurious dealers we get the advantage of the market.

Mr. Ladner. Is the New York "Herald" competent authority on the quotations of creamery butter?

Mr. Magaw. It is. In the regular stock papers there is quite a discrimination in the prices. We get better quotations from the Stockman than from the daily papers. They don't seem to get the market prices every day. The Pittsburgh "Dispatch" gives the most accurate prices we get. The New York market is the standard in the United States.

Mr. McClintock. We would like to hear from any one else on this subject.

Mr. Culp. I would like to know what they make oleomargarine of. If it is made of good material, why do people object to it?

Mr. Magaw. It is made from the caul that surrounds the stomach and intestines of beef cattle, and other animal fats, the oil of which is

pressed out. The factory I visited was as clean as any establishment I was ever in. The material tasted just as sweet as any butter or cream I ever tasted. I should be much more afraid of some of the poor butter made in Crawford county than that oleomargarine.

Mr. Monrad. I have tasted some that had no bad taste. It had no taste at all. They cannot get that fine nutty flavor that our president succeeds in getting; and which is not affected in price by the oleomargarine. It is the poor butter that suffers; but fine, high flavored butter, I hardly believe, has suffered materially, as yet. Thirty-five cents a pound would seem to indicate that our president is "getting there," just the same.

Mr. McClintock. If you make an A No. 1 gilt-edged butter, you can command in the retail stores about two cents a pound higher than creamery prices; but, just as creamery butter is affected by the sale of oleomargarine, so is our fine dairy butter affected. The dealers in oleomargarine buy low and sell low. It does not make any difference to them what price rules for our butter. If you have a standard trade, people will pay you just what you ask, regardless of the price of oleomargarine. I could get 60 or 70 cents per pound for my butter in Philadelphia, if I had a trade established; but not every dairyman has such a trade established. It is this class that will be most affected.

Mr. McLaughlin. I find, in a great many cases, that we have to take the situations in life as we find them. I have heard this agitation of the spurious butter question for a great many years; but it is yet with us, notwithstanding it has been legislated against and condemned by dairymen. There are three articles that we put on our bread to eat as butter: First, the superior article, which always commands a superior price. Second, oleomargarine, which must, unquestionably, come in here. I have Mr. Magaw's testimonial on the subject, and I have the testimonial of eating it. The third is the kind that we make too much of. You can go into a Chicago restaurant and eat a better class of butter than you generally get in our eastern states, and if you eat oleomargarine there, you will eat something better than much of the butter that is made. I know a very tidy lady in Chicago who went out to order some groceries, and, among the rest, ordered some butter. She said, "I will take some of this, here," and "this here" was oleomargarine. We took it up and I ate of it, and, although lacking the fine flavor of the superior butter, it was as good as we get at the average hotel here. It seems to me that we will do better as an association to accept the situation as it is, and give place to the oleomargarine because it is before us and we must accept the situation. Then, let us make this superior article that the president can get thirty-five cents for, and you can find a place for it. I agree with Mr. Magaw, that to make it you must commence with the boy that drives the cow. I was reading, just recently, about eggs. A gentleman in New Jersey has a hennery, and when the villagers come to see his method of raising eggs he asks them to go through the hennery quietly, without making any noise. He says it makes a difference of seventy-five eggs per day if they go through, exhibiting gaudy colors, and talking loudly. You may commence with the boy that drives the cow, and you must then look to the cleanliness of the pail, and be care-

ful that no objectionable matter goes into it. Educate them there. Accept the situation as it is, and make a poor quality of butter if you must, and get a corresponding price for it; or, make a better butter, and prove that the cow is yet superior, as she unquestionably is. Do that, and I apprehend that the Crawford county cheese and butter will so advance in quality and price that my friend can no longer say that there has been no advancement in fifteen years. There is another thing that I would like to speak of; that is, the exhibition of dairy products at the World's Fair. This association should be represented in some way. There is a beautiful edifice there, erected for this State, and our taxpayers are footing the bill. We have a right to go there. They have engraved on a tablet the word Pennsylvania, and when a Pennsylvanian goes through that hall, he feels proud to read those letters. Why not make a monument of the State Dairymen's exhibit there? We must not wait for our legislators to do it. We must do it ourselves. We have farmers in the legislature, but we don't get our laws just right because we haven't the power. The signs of the times are that some of the burden is going to be taken off the shoulders of the farmer. And I want to say in addition, that the real estate of this country is going to be worth a little more. It is time for the farmers to be served. We have Mr. McGill, a farmer, Senator Logan, and Mr. McMasters, both farmers, and Mr. Higby, I guess; Andrews, I guess. We have two interested in the dairy question. I think the best way is to accept the situation just as we find it. Make a good article for the people who are able to pay for it, and attend to our own business in our own way.

Mr. McClintock. We have four representatives in the legislature. Speaking of our representation at the World's Fair, our State has appropriated \$300,000 for all purposes. I wrote to the commissioner of dairy products, and his reply was that we are not a dairy State and were not entitled to any of the appropriation. I simply wrote and asked him if he knew how we stood in rank, according to the reports of our country. He never replied to the letter.

Mr. McLaughlin. That proves that our association has never been recognized. We have never had our rights. But I'll tell you what we can do; we can put an addition on the hall, and have the bill sent to Mr. Sibley, and have him pay it for us.

Mr. Monrad. I think the gentleman that spoke last is mistaken in one thing. As I understand it, it is not the intention to show any manufactured goods in the State building. At least it is so in Illinois. No manufactured product can be shown there. If you show anything, it must be in the proper dairy hall that has been provided for all the states that were willing to send goods and share the expense.

Secretary St. John. It may be well to review the history of our relations to the World's Fair exhibit. Two years ago last July, an invitation was sent out by the dairymen of Illinois to the several states of the Union to send representatives to a meeting to be held in Chicago on the 18th of that month, to fix upon a concerted plan to make the dairy exhibit the most effective. I was sent there by this association, to represent our State. Other delegates, to the number of about forty, were in that meeting, including Governor Hoard, Prof. Henry, J. H. Monrad, Lovejoy Johnson, Col. Littler, John Boyd, and

a host of names familiar to the dairy world. Several plans were fully discussed, but I wish to say, without flattery to Mr. Monrad, that the plan he advanced to make the dairy exhibit a veritable dairy school, secured the favor of the convention. In order to impress our plan upon the National commissioners and elaborate it, would require considerable expense. To secure this it was necessary for the dairy states to furnish each its share, which was estimated at \$200. When the Pennsylvania representative was asked to pledge that amount, I must confess that I was obliged to be careful to qualify my pledge with a proviso that we would be dependent on our State government, possibly, to furnish the funds. I knew that the legislature had appropriated a certain amount for the exhibition, but did not know whether any of this would be available for our purpose. I reported the matter to our association, but, as I feared, there was no money to meet the emergency. We thought we had enough at home to take care of the oleomargarine. It puts us in a rather embarrassing position as regards the Fair. We cannot get anything from the State to assist us unless the Commission see fit to grant it; but this they do not seem ready to do. We must depend upon ourselves, for there is none to help us. The Dairy Commissioner recently wrote me for information covering several points, to assist him in preparing a dairy chart to be placed on exhibition. He seemed to think that our association should be in possession of such information. I informed him that, while our association was, in a certain way, recognized by the State, we are not strictly a State organization, and that our funds were too limited to gather the statistics that we otherwise should. I further called his attention to the manner of obtaining our revenues, and the amount. I consulted Mr. Magaw, as the best authority on dairy statistics, and sent him all the information I could gather on the points in question. I further ascertained that no concerted action would likely be taken by our dairymen for an exhibit, but that I would forward the names of the members of the association if he wished. I have not heard from him since. We have failed to do anything in the national part, and it looks as if we should not have anything to do in the State part. It will be well to inquire "where are we at?"

Mr. Spitler. An association that has been organized for nineteen years, and has been acknowledged as a state organization, should be able to get an appropriation. There is a little bit of a bee association in this State that has obtained an appropriation for an exhibit. If this association had vim enough to attend to business, we would get the appropriation.

Secretary St. John. It might as well be plainly understood that we, as a simple organization of farmers, cannot get any appropriation we ask. Gentlemen talk as if we only had to "go for it" to get it; but this is not the case. There is a State Constitution standing in the way. The World's Fair Commission can doubtless allow us a sum from the \$300,000 appropriation made by the legislature, to make a dairy exhibit, if they please, but the pressure necessary is still an unknown quantity. The idea of a permanent appropriation may as well be dismissed, unless it be for the especial purpose of publishing the report of our meetings in pamphlet form, aside from the State agricultural report. Personally, I believe such an appropriation would be constitutional.

Mr. McLaughlin. Would we not be justified, in the interests of the dairy business in Crawford county, and this organization, to accept the situation and make our own exhibit at the Fair? Of course, it would take some money, and we feel a little delicate about doing it if it is the State's money, but we shall feel independent if we use our own money. I know manufacturers of cheese in this county can make as good cheese as can be made in the world. Would it not be a good idea to take steps during this meeting to make this an actual State Dairymen's Association of Crawford county, if there is no other way to secure a representation at the World's Fair? I have always understood that the products of Crawford county stand pretty well. Would it not be a long step in favor of our association to be represented there? We can do this if we will.

Mr. E. S. Crooker. Would it be possible to have a Crawford county State Dairymen's Association?

President McClintock. No, sir.

Mr. Crooker. Of course, it takes a good deal of the dignity out of it to find that we are not a State dairymen's association. My idea would be, if it were possible, to organize by re-organizing our association in such shape as to make it such.

Treasurer W. W. Dean. I should like to know if there is a State Ironmen's Association of Pennsylvania, or how they came to get their hands into the appropriation. It looks to me, even the Bee-keepers have the bulge on us. Let us walk up to the front and ask for our share. There is something wrong somewhere, or else we haven't cheek enough to step up to the chairman of the appropriating committee and demand our share. I believe we have a county dairymen's association as much as a State anything else. The State simply appropriates so much money and these little organizations come in and get what they can. That is the limit of the size of the grab they get out of the grab-bag. If we can get anything, let us do so.

Mr. Magaw. The association would show cheek in taking the money. If Crawford county could get an appropriation I would be in favor of making it that.

Mr. Dean. We are here to get information; let us ask the bee-keeper to inform us how they got their grab.

Mr. Spitler. I happened to be so unfortunate as not to have a hand in that bee-keeper's grab. I was requested to do all I could to get up a honey exhibit for the World's Fair. It was Philadelphia parties who went in and succeeded in getting from the Commissioner \$500 for the exhibit.

Mr. Crooker. Why does our secretary tell us that we are not a State organization? We have been taught to call it a State association.

President McClintock. We are not organized under State control.

Mr. Crooker. This appropriation business seems to depend a good deal upon who is getting it. When Mr. Spitler said that parties in Philadelphia got it, I do not wonder at it at all, because we know that parties in certain sections are favored above parties in other sections.

Mr. Spitler. I believe, if this Dairymen's Association would rise as one man, and demand their rights, they would get the appropriation. Ask unitedly for anything if you want it.

Mr. Dean. I move you that a committee be appointed to report some practical plan whereby we can have the State Dairymen's Association properly represented at Chicago. If it is found possible, it will be well; if not, we will go home and suck our thumbs, as we have done before.

This motion being seconded and carried unanimously, the president appointed C. A. Stranahan, L. A. Tucker and L. C. McLaughlin as such committee.

Mr. Monrad. Well, I do not wish to throw cold water on your plans, but I think you will find that your Commissioners are tied down to the exhibit of your natural resources, and not allowed to show manufactured products. They look upon butter and cheese as manufactured products. That is the reason why our Illinois dairymen cannot get an appropriation. Mr. President, not one cent has been appropriated for showing up the dairy interests. The law was passed with the Commissioners' sanction, and now they have their hands tied down. Nebraska has a dairy commissioner appointed, who has been to Chicago to look the ground over. I am afraid you cannot get any money that has not already been appropriated.

President McClintock. I have never been able to get any favorable reply about having our State represented in her dairy interests at the World's Fair. The appropriation seems to be beyond our reach.

Mr. Monrad. How many cows do you milk in Pennsylvania?

Mr. McClintock. We rank fourth among the dairy states.

Mr. Steele. Speaking of honey not being a manufactured product. I have heard different people say that they would not buy white honey, because it was manufactured out of white sugar; and they said they would rather buy the colored honey, made from buckwheat, then they would know that it was pure.

Mr. Lefever. There is no manufactured comb honey. They have none in Philadelphia, or anywhere else. You may take my word for it, they cannot produce it by artificial means. The idea that there is no genuine light-colored honey is preposterous.

Mr. Spitler. In addition to what has already been said, I would say that for the last four years there has been a standing offer of \$1,000 made by one of the best bee-keepers in the United States, A. I. Root, for any proof that there has been a single pound of comb honey manufactured by artificial means. There is an article that is manufactured and put in cans as strained honey, that is often adulterated, for which the bees are not responsible. The same may be said of maple molasses. There are samples that never saw a sugar tree. A gentleman, going along a street in Pittsburgh, saw a can labeled "Maple Molasses," and asked if it was not rather out of season for maple molasses. The reply was, "Oh, no; they are manufacturing it right upstairs there, now."

Mr. Steele. I understand that they take bees-wax and put it through a process of bleaching, and from this make the comb, and the spurious honey is put into these cells and sold.

Mr. Spitler. I wish to say to our friend here, that we have lots of honey that the bees fail to cap. It is not a salable product. It has been a query with us how to get it capped. If the bees could be kept at work long enough they would cap it, but the natural supply often

fails before that point in their work is reached. We have tried feeding honey, but we find that the bees consume as much honey while at work as they store in the hive; so it does not pay to feed honey for that purpose. For the same reason it does not pay to make honey in this way out of granulated sugar.

Mr. Lefever. I was sorry to hear that there has been no improvement in cheese in the last fifteen years. I know there has been improvement in butter and bees, but not in the product of the bees. They can manufacture the finest product produced in the world, but when it comes into the hand of man, it is sometimes mixed up and spoiled. Don't think all the honey you get is adulterated. You don't get any adulterated comb honey. Bee-keepers have tried again and again to feed extracted honey to their bees to get it back again in comb honey, but there is no profit in it.

Mr. Fox. I would like to hear from Mr. Magaw about the boy that feeds the cow.

Mr. Magaw. I don't think dairymen need any instruction in this. If the boy is properly instructed by his father he will do it properly, and the father should know enough to instruct the boy. I profess to be a first-rate salesman for a first-rate cheese, and a most miserable salesman for a poor cheese. I send thousands of boxes of Crawford county cheese to Mr. Monrad's state. Crawford county cheese is known as far west as the Pacific slope and as far east as Liverpool, England. They stand high when they are up to the standard. We can make the best butter and cheese that can be made on earth, and we should produce the best honey that can be made on earth, and then we will make a success of the whole business.

John Fox. The buckets may be clean, the milker may be dressed in proper uniform, the cans may be sweet, and the manufacturer and everything around him in the best of order, and yet the cow may have eaten something that will taint the milk. For instance, she may have eaten onions, turnips, or something that will flavor the milk.

Mr. Magaw. When that kind of milk is received at the factory it should be returned to the patron where it belongs.

Mr. Fox. All ensilage has an alcoholic taste. Would that affect the milk?

Mr. Magaw. I am not afraid of it at all. Ensilage, properly put up, is good for the cow. Mr. McClintock will tell you of the ensilage that he feeds to his cows, that costs him but \$1.50 a ton.

Mr. Fox. Will cotton seed meal affect the flavor of the milk?

Mr. Magaw. I think not.

David Shontz. I was once a dairyman in a small way, and I was not a little humiliated at the remarks of Mr. Magaw at the opening of this discussion. I had learned to estimate the cheese of Crawford county pretty high. He notified us that the west is going ahead of us, while Crawford county has been standing still for fifteen years in the matter of cheese making. Now, he says we are sending the finest cheese into Illinois, to the "woolly west," and as far east as London. I think he is coming back to himself. That has been the tenor of his talk for several years gone by.

Mr. Monrad. I don't think the point is well taken in the last speaker's remarks, criticising Mr. Magaw. It took five years to put the im-

print on your cheese; it took eight years to put the imprint on Wisconsin cheese.

Mr. Shontz. We were not discussing the quality of the cheese.

Mr. McClintock. I can never buy any good cheese at home, in this town. I have to go away from Crawford county to get good Crawford county cheese. If we do make good cheese, somebody else gets the benefit of it. But, as it is getting about time to adjourn the secretary will make an announcement.

Secretary St. John. I wish to say a word about membership in this association. At our last meeting there were but four new members added to our list. This is not as it should be, and I think it is because some of those who attend do not understand the advantages of being a member. As an organization we are recognized by the State, and our reports are incorporated in the agricultural report of the State. So far we are a State organization. One dollar makes you a life member of the association, without additional dues or expenses hereafter. Now, for the advantages: First. You are identified with the work of the association. You become one of the component parts of a whole that is pushing a work for the advantage of every dairyman and farmer in the State. You add your weight to the movement.

Second. The State agricultural reports are a valuable addition to every farmer's library. There are a limited number printed, and not every farmer can procure one, though there seems enough to meet the present demand and means of distribution. An ample supply for all our members is sent to our secretary, and so you have a copy reserved for you until you are able to get it. I am obliged to furnish these on demand, and nobody can take your share.

Third. You have the advantage of knowing just what is going to be done at each meeting, as a programme is sent to each member, of all meetings. This not only reminds you of the time of meeting, but it stimulates your interest in the work of the meeting. You come prepared to get the greatest possible good from it. The dollar which you are required to pay is only a drop in the expense of our meetings, but it is necessary that you so identify yourself with us, and the dollar goes right into the general fund to carry on the work.

A member. Is one dollar all the expense of becoming a member?

Secretary St. John. That is all; and no yearly dues are demanded. Our constitution is simple, and our laws do not require a judge to apply them.

President McClintock. One of these reports is worth ten times as much as you pay for it, even if you had to pay a dollar each year. I wouldn't be without mine for ten dollars a year..

WEDNESDAY EVENING.

The evening session was called to order by the president at 7.30 o'clock, and the discussion resumed.

T. J. Brush. Where it is not convenient to have water in the stable

all the time, what difference does it make with dairy cows whether they are watered before or after eating their grain?

President McClintock. I will call on Mr. Monrad to answer that question.

Mr. Monrad. I do not believe it will hurt digestion at all to water immediately after eating grain, if the water is warm. Ice water will hinder digestion.

A Member. There are a few good dairymen in Crawford county who go to the trouble of warming the water for cattle, whether taken before or after eating; therefore, I take it for granted that cold water retards digestion.

President McClintock. Cold water, once a day, will not harm them a particle.

Mr. Brush. If we turn them out to water before we feed in the morning, they do not drink much, and by evening they are too thirsty. I believe you can educate a dairy cow to being watered once a day, and she will drink as much at one time as when watered twice a day. I would like to ask whether it makes any difference in the feeding of chop, dry or wet. Does it make any perceptible difference, any more than wetting any other feed?

Secretary St. John. I tested that point this very season, and my cow did better on the dry feed. It looked like a dry experiment to feed a cow dry chop and bran, but the pail was just as full at each milking, and the cow's hair was sleeker. I shall never wet my cow's grain ration again.

Mr. Monrad. That is the general experience of dairymen.

President McClintock. That has been my practice for five or six years. I water my cattle right after they are fed. I believe they digest their food just as readily as if we did not water them at that time.

Mr. Brush. If there is a veterinary surgeon present, I should like to hear his opinion on this subject. I am under the impression that horses are apt to have the heaves if you water them before feeding.

Mr. Sibley. With horses it is recognized as a very dangerous thing to feed them and then water them immediately. I do not see why the same thing should not be true of the bovine race. A large quantity of water given right after a feed of grain would carry it beyond the reach of rumination, and this would deprive the animal of the proper nourishment from it. It should not be diverted from its proper destination. We can also warm the water that the animal drinks, with wood and coal, cheaper than we can with grain.

Mr. Crooker. I keep several horses, and I never water them in the morning until after they are fed, and my horses do not have colic. Our chairman says that his cows do better to water after feeding. If they do better by following that plan, it is better to pursue it; but never give her anything that goes against her health, for anything that does that will affect the quantity of milk she gives.

Mr. Monrad. I suggest that we leave this whole matter to the cow, and that we put the water in a place where she can choose for herself.

George M. Orris. As I understand the digestive apparatus of the cow, whenever fine food is taken alone in the stomach, it goes immediately into the second stomach, without stopping in the paunch at

all; whereas, if you mix the fine with coarse food, it goes into the paunch, its proper destination. Again, the paunch should be as full of water as it will hold in order to float this mass, and, after it is brought up in the form of the cud and masticated, it goes on its way into the second stomach. By filling the cow up with water it will not wash any of the grain out of the stomach. A horse's stomach is entirely different, and if you water immediately after feeding the food passes into the stomach without proper preparation for digestion.

H. S. Robinson. Would it not be a good idea to mail to each farmer in Crawford county, the recipe for making good butter?

Mr. Phelps. You may send out just as many receipts for making cheese and butter as there are patrons in Crawford county, and it won't pay the postage. A man may get just as many receipts as possible, and if he has no experience he will be a failure. A man that never made any butter may be told how to make butter and he will surely fail in the attempt. There are so many things connected with the art that you cannot explain. In regard to the receipt business—I do not take much stock in it. A man that has experience can get an idea from paper that may lead him into a better way; and yet, circumstances change matters considerably in that line. Hardly two herds will churn at the same temperature. Now then, you pass your receipt to churn at 67, 68 or 70 degrees, and you will be met with failure, as a general thing. My dairy churns at 70 degrees, cannot do it at any less. That is the standard temperature for me.

Question. How long does it take you to churn?

Mr. Phelps. Half an hour.

Question. What do you feed for a butter ration?

Mr. Phelps. I feed linseed meal, six pounds; ensilage, 40 pounds, and hay, eight pounds. It costs me 17 1-2 cents to make a pound of butter, and it sells in Pittsburgh for 36 cents.

Question. Do you feed all the cows alike?

Mr. Phelps. I do not. Cows differ in temperament, and require different feed.

Mr. Crooker. If you were going to make a full grain ration of linseed meal, would you use the old or the new process?

Mr. Phelps. I prefer the new process, because it has less oil than the old. If you want to buy linseed meal, buy it about July or August. They are generally overstocked then, and will sell reasonably. If I had bought a month earlier this year I could have saved a dollar or two.

Mr. Crooker. So you consider linseed meal, at present prices, as cheap food as you can buy for your cows?

Mr. Phelps. Yes, sir. I would have it if I had to pay \$30 a ton for it. No one kind of food, no matter what it is, should be fed in a full ration. But I see by the programme that I am on for a talk, and so will tell you more about this later.

Question. There is a farm on a plateau which has a swamp of, say 30 acres; there is no other water source on the farm. How can this water be made fit for the drink of man and beast? And would not this swamp, if drained, in a long continued drought get so dry that no crop would grow there?

Nevin R. Dickson. Running streams undergo purification by the

absorption of oxygen from the atmosphere. The water can be removed from the soil, either by means of canals or open ditches, or by underground sewers, pipes or hollow tubes. No part of farm husbandry pays so well in proportion to the money invested, as judicious drainage. Thorough drainage not only relieves the first mentioned evil, but it greatly mitigates the bad effects of dry weather. The soil, deepened by drainage, permits growing crops to put forth longer roots, and thus become secured against drought. To make it fit for cattle, drain it through a gravel bank. To make it fit for people to drink, filter it through charcoal.

DAIRY EDUCATION.

By J. H. MONRAD, *of Illinois.*

Mr. President, Ladies and Gentlemen: I feel rather diffident in appearing before you in the role of the wise man. Wise men are supposed to come from the East, and as I come from the West, you have no right to expect much of me.

I have, ever since I had my dairy eyes opened, some twenty years ago, under the tuition of Prof. Segelcke and the late Prof. Fjord, been a warm advocate of dairy education; and hence, when your secretary invited me to speak on that subject, I accepted it with a most Chicagoan recklessness and self-confidence. Alas! for me, and still more alas! for you, I have found the job bigger than I thought.

In these days of high education in all and every branch, it should seem quite superfluous to say anything about the necessity of higher dairy education. Yet, owing to the scattered location of the dairy industry, the art of butter and cheese-making was, up to the time of Jesse Williams (1851) more a part of the housewife's work, and had not attained to the dignity of a manufacturing industry.

At a time when one woman handled at most the milk of 40 cows, there was less call for a thorough scientific manipulation than now, when one factory handles the milk of 1,000 cows.

With the responsibility for the making or marring of the product from 10,000 to 20,000 lbs. of milk is on one man's shoulders, he should naturally be only too quick to seek in every way the aid which modern science offers him. Indeed, the demands made on the modern butter and cheese maker for "all-round" ability and knowledge, are heavier than on any other single profession that I know of.

Just think of all that a modern creameryman needs to be! He should understand human nature and have the corners rubbed off him, so as to understand the proper handling of his different patrons, induce them to take good care of the milk, and to see how closely their mutual interests are united.

He should have an inborn, or perhaps I should say, a well-trained sense of cleanliness, combined with that of a fine smell.

He should be trained to take a fair, average sample of milk; and remember that this is half the test. He should understand chemistry and bacteriology as connected with his profession, so as to act in an intelligent and reasoning, instead of perfunctory manner.

He should know considerable about boilers and engines, and be half a mechanic. He should be at home in all the different systems of cream raising, and understand the ripening of the cream from them.

He should know about centrifugal force, so as to appreciate the enormous danger he runs by increasing the speed of his separator over that designated by the manufacturers.

He should know a good deal about churns and butter workers.

He should know the demands of different markets as to color, salt, and packages.

He should be a fair penman and bookkeeper.

He should know enough about profitable milk production to aid his patrons by practical advice; and last, but not least, he should be honest.

Have I exaggerated in this estimate?

If not, no one can for a moment doubt the necessity of dairy education.

The best methods to accomplish it?

This is a harder nut to crack, and if cracked, to digest, in one meeting, or even in several meetings.

A system practicable in Denmark may not do in France. One successful in Germany may not do in England, and neither of them may suit in America; and even here, Wisconsin may need one system, Kansas another and Pennsylvania a third.

Then, again, comes the question, is the dairy school intended to give old makers a theoretical finish, or to train boys (and girls, I hope) from the start?

I have given this subject considerable thought, even before your association honored me with your invitation; and since then I have several nights gone to sleep in the fond, but delusive hope, that some dairy angel might give me a revelation in my dreams.

But the problem was not solved, and I am ashamed to confess that I come before you with no advice as to the best system for you to adopt, and must be satisfied if I should succeed in aiding you a little in making it easier for you to choose for yourself. Let us then glance over the different systems adopted:

Denmark.

The first step in dairy education in Denmark was taken about 1860, when the agricultural society engaged Mr. Segelcke to act as dairy counsellor, who, after visiting foreign countries, traveled among the farmers and helped the butter makers when they were in trouble, paying especial attention to the ripening of the cream, and churning temperature. He also induced the farmers to keep a milk record for each cow and establish a test milking once a week.

He also established a system of apprenticeship, whereby young men were assigned places on good dairy farms, where they had to partake in all of the dairy work. By a system of blank books and corresponding forms, Mr. Segelcke compelled them to think over their work, and

in his office watched their development through their filling in the blank books and mailing him the copies weekly.

To illustrate: In cream barrel (vat) No. 1 was filled so many pounds of cream, skimmed from so many pounds of milk; it was heated to such a degree, at such an hour; the temperature in the room was so much; at such an hour the cream was so warm, and in such a condition, and so on. The apprentice was compelled, *nolens volens*, to observe these little details and to keep track each day of how many pounds of milk there were used to one pound of butter.

Also, the number of cows milked, their period of lactation, feed, &c. Indeed he had a pen picture of the daily work going on, and of the student's power of observation. One of the books (the last one) had several blank pages like this:

Describe "The influence of the period of lactation on the quality of the milk."

"The conditions which affect cream-raising and the different systems."

"Butter-making, churning, salting, coloring, working and packing," and so on, making the student reply to a regular set of examination questions.

About 1870 the Royal Agricultural School erected the first chair in dairying, and Mr. Segelcke was appointed to fill it, and so has the honor of being the first dairy professor.

As such, he gave a regular course of 100 lectures, but no practical instruction was given in butter and cheese-making. The system of apprenticeship was continued for those who wished to make a specialty of dairying.

Since that time the Separators have revolutionized the dairy system of Denmark, and co-operative creameries have become general. Several private agricultural schools give lectures on dairying and a limited amount of practical instruction, but the main education in practical work is given in the shape of apprenticeship in the creameries. Indeed, it is quite common for a creamery manager to have only one paid assistant, while three or four apprentices do all the work. Several traveling, consulting dairy instructors are also employed by the different county associations.

Germany.

Germany has several schools, where, as in Kiel, they give, in addition to lectures, practical instruction in butter and cheese-making; but that they evidently rely mostly on the apprenticeship system for practical education is shown by the following extract from a meeting of one of their creamery associations:

"Dr. Krueger, of Hildeshim, expressed as his opinion of dairy education, that a year's apprenticeship was not enough, now; he recommended one year's training at a creamery where only one apprentice was kept, then a course in a dairy school, and then a three to four years' service as a helper in a creamery, after which time he would be able to manage a small creamery; if a large one, he ought to take a post-graduate course at a dairy school where he should be given the chance of experimenting."

France and Holland.

No attempt, as far as I know, has been made in Holland and France to give more than a theoretical knowledge in the schools.

England.

The British Dairy Institute is a school, buying milk and giving lectures on and practical instruction in butter and fancy cheese-making; but as far as I understand, it has been used more as a finishing polish to practical makers who wished to train for higher positions, or for traveling dairy teachers.

The traveling dairy schools seem, according to the description of them in the English papers, to lay their chief stress on the churning and working of the butter; and the most important part, the cream-ripening, seems to be slurred over, while the forming of butter into "lovely" flowers is taught.

Scotland.

In Scotland, they have some practical cheese instruction, a cheese-instructor visiting a cheese-making farm on certain days, and the neighboring makers (from ten to twenty) coming there to learn what they can.

Ireland.

In Ireland they have an excellent farm school (near Cork) where practical and theoretical dairying is taught; and it is a noteworthy fact that railroads in Ireland appreciate the value of dairy education to the country, to the extent of giving the students free transportation.

America.

The first attempt in dairy schools was made by the late Mr. Valentine, on the Houghton farm, and that it did not succeed is not the fault of the manager, but simply the fact that at that time even our agricultural educators had not had their eyes opened to the importance of this subject.

New York.

The traveling dairy schools of New York, which, in connection with the traveling cheese instructors, have done a great deal of good in the shape of "Mahomet coming to the mountain when the mountain won't come to Mahomet."

Wisconsin.

Prof. Henry opened the first dairy school, in a modest building, and gave a short course in butter and cheese-making, as well as lectures. Having an exceptionally good staff of teachers; and the milk-test fever just then culminating in Dr. Babcock's test, he had no difficulty in inducing the Board of Regents to put up the present large and con-

venient building. The school is provided with nearly all the different separators, kindly loaned by the manufacturers, and eight 300-pound cheese vats, besides other utensils.

The system is shortly as follows: The course lasts about ten weeks, and is divided into four sub-courses. (1) Lectures on dairying. (2) Milk testing. (3) Butter making. (4) Cheese making. The students are divided into three sections, all of whom attend the lectures every morning from 8 to 9, and then each division goes to work in either of the three other sub-courses; then every student will have two milk-testing, two butter-making, and two cheese-making days in the week. Those students who have previous practical experience are expected to take part in all the work in the beginning; but after a few weeks, they are put in an advanced class called the experimental section.

Here they find problems which give useful training, no matter how experienced they are. Dairy certificates are issued only to those students who have passed a satisfactory examination in the course, and who have worked at least two seasons, of not less than seven months each, in a creamery or cheese factory. One of these seasons must be after the school course, and the candidate must report his work to the school monthly, or as often as required, and must submit to an unexpected visit from an inspector from the school.

The expense, of a course, amounts to about \$68 for residents, and \$70 for non-residents, exclusive of the railroad fare. About 100 students attended this school last year.

Minnesota.

This school is not quite so large as Wisconsin's, but is run on a somewhat similar plan, though perhaps more attention is paid to farm dairying. It has about 50 students, and Prof. Smith told me that he considered it was for the best interests of the students not to be overcrowded.

Iowa.

At Ames, a new departure has been made. A large creamery and cheese factory is built, and by aid of long hauling, quite a large quantity of milk has been secured; and it is run on a commercial basis.

This creamery is operated all the year, giving the agricultural, long-course students a chance of dairying any time of the year, with a three months' short course for special dairy students. This year, I understand, it is the intention to have three short courses during the year, commencing December 1, March 1, and August 1.

I am also pleased to be able to report the appointment of a special dairy lecturer (Mr. H. C. Wallace) who will, so to say, form the connecting link between the scientific and practical part of this school. Fifty students attended last year.

We have thus really five different systems (with some variations).

(1) A theoretical short course (where the student does not see a cow or a pound of milk) with an apprenticeship in a select, large dairy or creamery, while the teachers keep tab on the students by their written reports.

(2) The short course, giving not only theoretical lectures, but also practical instruction in butter-making on a small scale.

(3) The creamery school which, besides theoretical instruction, aims at turning out finished butter-makers.

(4) Traveling dairy schools where one, two, or more lecturers carry utensils for ocular demonstration in butter-making on a small scale.

(5) A combination of the two first which would be something similar to that used in Wisconsin.

All these systems can and ought to be supplemented by traveling instructors, who visit creameries, cheese factories and dairies, and who are willing to pay at least a part of their expenses.

Let me also add that, whatever system is adopted, the success will depend upon the ability of the man at the head of the school to select his assistants. It is, as for instance, not always the best maker which turns out to be the best teacher. It is also very important to secure a harmonious co-operation between the men at the vats and churn and the scientific lecturers.

Let me explain that there is no need of going to any very large expense, if the directors and Board of Regents of the present agricultural college and experiment station are friendly to the dairy.

All that is needed in that case is a building which would cost from \$25,000 to \$40,000 complete, a special dairy chemist and bacteriologist, a practical butter and cheese-maker, a stenographer, and a janitor, calling in all for a yearly salary list of about \$8,500.

My idea would then be to have one or two three-month courses in the year, and one long two years' course for creamery and cheese factory makers, who wish to train for traveling instructors. Their second year's work would be chiefly as assistant teachers and experimenters.

Long-course students should pay no fees, but should board themselves.

Short-course students should preferably have had one year's practical experience in a creamery or cheese factory, and during their second year in the creamery their work should be controlled by reports, and inspected, at the end of which, if satisfaction has been given, they should be entitled to a certificate as a maker.

A second year's satisfactory short course in the school, taking an extended instruction in book-keeping and experimenting, should entitle them to a certificate as factory manager.

The dairy school director should be an enthusiast and have complete control of the school, staking his reputation on its success or non-success.

There are, however, some states where the location of the agricultural colleges seems to influence all connected with it in a way that inclines me to believe in the existence of an anti-dairy bacteria.

In such states, the only salvation is the erection of an independent dairy school and experiment station, with a dairy farm attached, and that can only be done if some philanthropic Armour or Rockafeller should donate a fund which would yield a yearly income of about \$25,000 for that purpose.

Finally, let me urge you to extend the good work which is commenced; you will never regret it.

Discussion.

J. B. Phelps. I was interested in Mr. Monrad's remarks; but there are some things I suppose I will have to criticise. Theories don't go far in comparison with facts. He spoke in regard to the Babcock tester being used in cheese-making. I would inform our friend from the west that this is a cheesemaking district. There are very few creameries in this vicinity. It is a question in my mind whether it is exactly what we want. If you have a tester that will test the butter fats and the casine, in my opinion that will be best; but when you test one part alone, in my opinion, there will be a discrepancy. I have heard men say that the silo was a total failure, but to-day they are using it. Perhaps in a few years Brother Monrad will use the Babcock tester. I made the declaration in this dairy hall several years ago, and was very severely criticised for it, that if the butter was chuck full of pure butter fat, all the rennet in Christendom would not make a pound of cheese. You cannot make an ounce of cheese from pure butter fat. Casine is the most important factor in cheese-making. I will say this—I do hope and pray that the time will come that somebody will invent some instrument to keep the farmers honest, that they may send their milk to the factory and give its par value; and after doing that, we will have the methods to test both the butter fat and casine. Suppose I make 200 pounds of milk, and have a Baby separator at home. They are going to pay me according to the butter fat. I will run it through my Baby separator. That 200 pounds of pure milk will test 6 per cent. Now, I have the par value of just what my milk will do. By using the separator I will gain 40 cents. In regard to the women milking—I protest on that point. The milking-yard is not the place for women. It is not according to the spirit of the age, and I do not believe they ought to be there. I believe the place for a woman is in the house, attending to her business, but in some cases and at some times it is all right for women to do the milking.

Mrs. Helen Johnson. You know we say there are exceptions to all cases. Our girls are being educated away from this work, and there are people who would not allow their daughters to milk. It is just as honorable to do one kind of farm work as another. We want the true education of heart, intellect and hand. We will never have perfect womankind until we have that. We must do away with the false theory that labor is degrading, whether performed by a man or woman.

Mr. Monrad. That makes me feel good. We don't care for your theories. I said to a lady: "Why don't you use a thermometer?" She answered, "I am a number one butter maker. I use my thumb." In 1891, just after the Babcock tester was introduced, I had exactly Mr. Phelps' idea. I said it was a good thing for the butter makers, but would not do for cheese makers. I sat down and read in this little pamphlet about milk testing, and started a little pamphlet for the purpose of proving that it was not a true test, and I had to confess that in the past it was the best we could do. In New York we have been testing the milk during the past year in factories, and have proven that the Babcock test is a fair one, unless we have to deal with some men like Brother Phelps, who wants to keep the skim-

milk for his pigs. If I was running a cheese factory, I could pay him for his butter fat. There would be enough skim-milk cows in the neighborhood to need a little of Brother Phelps' Jersey fat to help it out. Compare that with the injustice we are practicing now. By the present Cooley system you are doing injustice to Mr. Phelps at 25 cents a hundred. There is injustice in the separator, I admit. There are other obstacles in the way. The very breeders for whose benefit the Babcock test was invented, the Jersey breeders, have thrown more obstacles in the way than any others. They derive more benefit from it than any one else; it enables them to sell their milk at an advantage. Is it fair to pay the same for 6 per cent. milk, or for 5 per cent. milk as for only 2 per cent.? I agree with Mr. Phelps that ninety-nine out of a hundred American barns are not fit places for ladies to milk in; but with a clean cow and a clean barn, I fail to see why women are not the people to do the milking. If Mr. Hoard had done nothing else but write those articles on the maternity of the cow, I say dairy-men owe him a great debt, because there lies the secret of successful dairying—the proper understanding of the cow. And there again we have the reason why women are more successful milkers. At one time I tested the milk of a cow, and although I hadn't seen her milked, I felt pretty sure it was not all right, and the lady insisted on knowing how the milk tested. I said, "I don't understand it." Suddenly the old lady said, "Why, my boy milked this morning, and I generally milk those cows." I tested the milk the next morning and it came right up, over one per cent. The cows loved that lady. Treat the cows as your friends. I see no reason why our girls should not milk. I see no reason why they should not do that work if there are proper facilities.

Crooker. I will say this much for Phelps—it would be all right for a lady to go into his barn to milk. He has everything nice and clean, everything in good shape, and a boiler and engine to run it. When he was telling about separating that milk, I thought there wasn't another man in Crawford county that would have thought of it. How he ever got that idea in his head is more than I can understand.

Mrs. Helen S. Johnson. I would like to say just a word on the question of clean barns. I have always contended that as soon as women can vote the polls will be a clean place; and I have no doubt that when the daughters go out to milk, the men will clean up the barn. A woman will make the conditions, or she will make the conditions that will make the conditions.

A Member. A barn that is not clean enough for a woman is not clean enough for a man.

Monrad. When I was in Sheboygan I said to a manufacturer, "Who have you for the cheese-maker here?" He said, "A woman." I don't mean for women to handle 60-pound butter tubs or do that kind of work. There should be a strong man for that, one who is good for nothing else.

Hon. J. C. Sibley. I am willing for woman to have her share of equal rights; but I do not know that I have any recollection of any work that was of a more severe character than milking ten cows in the morning. I have a good, large hand for a man of my inches, and these muscles were developed by milking ten cows in the morning, but I would rather do anything else. I think it is the most severe work

done on the farm. I think the women might, if they wish, ride the sulky-rake or the sulky-harrow, but when we ask our women folks to milk a cow as rapidly as she needs to be milked in order to secure the best results, we are asking them to do the heaviest part of the farm work, and are going back to that condition from which our women have been emancipated.

Mr. Crooker. If he had had three or four sisters to help him milk it would have been easier for all of them. When I milked eight or ten cows it was a very hard job.

Mr. Sibley. It may be all right, but I will tell you the fact is that the poorest farms are the ones where the women do the milking and the men sit on the fence and see them do it.

Mr. Monrad. I suppose that Mr. Sibley, when a boy, was put to the milking as many of them are now. Instead of figuring on the milking as part of the day's work, it is considered a little chore. I do not think it is any hardship for girls to develop a little muscle. It is not for the good of the coming generation for our women to be placed on a high pedestal to be worshipped. If I were to milk ten cows to-day, to-morrow I could hardly move my arms. For the first week one should only milk three or four cows, and then increase the number. In Holland and Denmark I have seen a woman milk 20 cows, and there was no harm in that, and from the muscle developed I guess her husband wouldn't boss her too much.

Mr. Sibley. I have seen this muscle developed in foreign countries. I have seen women there dragging the plow and the harrow; I have seen them dragging brush and scratching in the seed. They had all the muscle that my friend would want to see. We saw it, and commented on it, and wondered at it. We saw the women climbing the hillsides with bundles of fagots on their backs. If my wife will keep the home pleasant and cheerful I will try and keep the office end right. If she wants to go to the barns with me, and make suggestions, as she often does, that is all right.

Mrs. Johnson. I know that people can be honest and differ. I know that Mr. Sibley is a friend of womankind, and I believe that I am, too; and I wouldn't intentionally take a step backward. I believe that nobody should work more than four or five hours a day. I want equality. I want to make the best of existing conditions, and I believe in girls learning how to do all kinds of housework. When I was married I knew nothing about housework, and sweeping a room would blister my hands. If my daughters were obliged to go into a store, that is hard work, and girls who stand on their feet all day do not make very healthy women. There are thousands of people who can keep their girls without work, but on a farm where there is a large family of girls and no boys, I see no reason why they should not help father with the milking.

Mr. Monrad. I have seen the same sights Mr. Sibley has; but while I pitied them I admired them. I think we are talking from a man's standpoint on this girl problem. It has become so that a girl is ashamed to do the work her mother has done before her. She is ashamed to do the work she will have to do later on in life. A girl can go out as a servant and get five or six dollars a week, or she can go into a store and get four dollars a week and board herself, but I say

it is for the good of the coming generation that they work in the household and milk cows, rather than stand behind the counter.

Mr. Phelps. I am thoroughly convinced that I shall have a Babcock tester. I notice that with the amount of milk that I get from my separator I vary in the quantity of cream. With the same amount of milk I vary in the quantity of cream. I churn about the same amount of butter every day.

A. L. Wales. Is the temperature of your cream the same every day?

Mr. Phelps. Yes sir, and the separator is run as nearly alike as possible every day.

Mr. Wales. Unless one is careful in cleaning the machine, the setting may be changed without knowing it.

Mr. McClintock. If you don't have your milk up to the same height every time, it will vary in the quantity of cream. If it is lower down it thickens; if the can is full the cream is thinner. I had about eight inches in height and I found that I got a big quantity of cream but I got no more butter.

Mr. Monrad. From the same quantity of milk, the separator would give the same amount of cream and the same amount of butter fat.

A Member. An increase in the speed of the machine will make a difference, but you can only get about so much butter fat out of the milk.

Dr. McLean, V. S. I have been asked why it makes any difference in giving water before or after feeding. The ruminants have not really four stomachs, but there are four parts. One of them is a receptacle for water. During feeding the food passes into the paunch, or the receptacle for food. The water goes through the same opening, and the majority of it stays in that division known as the reticulum. Feeding before watering has a tendency to retard digestion for a time. In the reticulum the food is moistened and turned into pellets, which the animal can bring back to the mouth to be chewed again, after which it passes to the fourth part where it is digested. With horses it is entirely different. Horses have a tendency to colic if watered after feeding. If you feed oats and then water, it distends the wall of the stomach. You cannot wash the food out of a cow's stomach like you can out of a horse's.

Question. How much water should a horse have, and how often a day?

Dr. McLean. That depends a good deal on the water. An ordinary pailful at a time is enough.

Question. To what temperature would you heat the water for horses and cattle to drink?

Dr. McLean. Perhaps there is nothing more grateful to a horse or cow than a drink of good, cold water. Water at about 50 or 60 degrees is about right for horses or cattle; 50 or 55 degrees is not too cold for either a horse or a cow.

Question. Should a horse be watered when warm? At noon, for instance.

Dr. McLean. It is very injurious to water a team that has been driven fast or worked hard.

Question. Are you liable to founder a horse if driven right along after watering?

Answer. No, sir. If you water a hot horse and put him in the stable he chills very quickly.

Question. Should a horse be driven slow for a while after watering?

Answer. Drive at the same speed you have been driving before he drank. Horses are like people; they get used to abuse. I have seen horses in the livery stable that got used to abuse.

Mr. Sibley. I have been asked to bring up the subject of changing the time of meeting from the winter to the summer. It is suggested that we hold a summer convention at the Conneaut Lake Exposition grounds. The expenses of the association would be nothing. Steam would be furnished; water, buildings, and appliances. We could see these things in actual operation. Now, suppose we have the best butter-maker in Crawford county go there and make butter, and we can watch it through every stage of preparation, from the cow to the table. I think we have about \$300 left over from year to year. Maybe it would induce our legislators to appropriate more money. Maybe that is one of the causes that operates against an increase of the appropriation. If I should not be present in the morning I should like to get the opinion of the dairymen of Pennsylvania on the subject.

Mr. McLaughlin. Some one has said that the constitution provided that the sessions be held in the city limits.

W. W. Dean: I move that this be made a special subject for discussion the first thing to-morrow, when we come to order in the forenoon.

Motion seconded, and meeting adjourned to meet at 9 o'clock, Thursday morning.

THURSDAY MORNING SESSION.

The session Thursday morning opened with a talk on "Winter Dairying," by E. S. Crooker, Union City. He spoke in substance as follows: "We farmers are perhaps as conservative a class as we have. The farmers are more inclined to follow in the paths of their forefathers, and less inclined to take up new methods, than perhaps any other class of people; but thanks to our Alliances, our farmers' institutes, our Dairymen's Association, our agricultural papers, and last, but not least, our Granges, we are getting a little more wide awake, a little more progressive, and a great many of us are seeking for better methods. Among these improvements a good many of us are taking up the matter of winter dairying. The old practice of our forefathers was to winter cattle just as cheaply as they could, and get through with just as little feed as possible—any way to get them through until spring, and then turn them out to grass. I can remember when all we used to aim at was to get our cows through until spring; and sometimes I remember, when I was a boy, we used to have to go to the

neighbors for help to get the cows up. We thought it made them tough; made their constitutions more rugged and it did not cost as much to feed them through the winter. We are beginning to learn that with that method of treatment we were saving at the spigot and losing at the bung-hole. We find the best way to do with our cows is to give them full feed the year 'round. Whenever the grass begins to decrease in quantity, give them something to keep up the flow of milk as long as possible. A cow that will not give milk from ten and a-half to eleven months in the year is not worth keeping, and still a great many of our farmers say that they will not milk their cows in the winter. A man said to me, "I cannot afford to milk my cows through the winter. I can feed them hay and get through all right; if I milked them I would have to feed them grain." I never saw a chance to get something for nothing, and if a man does think he has gotten something for nothing, some other fellow will get it back before long. We cannot do that with our cows. We have found out by experience that it is necessary to feed cows some time before we want to get the best results and bring them where they ought to be. When I went to my farm, seven years ago last fall, I had a tenant on the farm who had not been in the habit of keeping his cows very well through the winter. These cows had been dried off in the fall, and by hard work I had them in pretty good condition the next summer, but not nearly so good as they were the summer afterwards. You cannot bring a cow up immediately to where you want her. The old idea was that you could spoil a cow by feeding her. You cannot spoil a cow by feeding her; you might by over-feeding. You cannot bring them up in a day or a week or a month. Mr. Sibley said if he wanted to test a cow and bring her up to her full capacity he would prepare her for it six months before he wanted to test her. If you let a cow begin to shrink in her milk, it is a very exceptional thing for you to bring her back to where she ought to be. It is like a man firing a boiler. When he needs 60 pounds of steam to run, and has but 40 in starting, it takes a great deal more to bring it up to 60 pounds; but starting with 80 pounds—20 pounds reserve force—he can keep up his steam very readily and run with a great deal less work and less fuel. You must reserve some of the capacity of the cow for contingencies. I cannot understand why a farmer should let his cows go dry during the time of the year that he can get the most for his product. You must keep the cow anyway. If you just feed her enough to keep up that 40 pounds of steam you never get any results from it at all; it doesn't pay you a cent. If you just give her enough to live you are throwing away your time and getting nothing from her. In the summer you get a low price for your dairy product, and in the winter when prices are good I find lots of farmers loafing around the corner grocery when they ought to be at home taking care of their cows. We cannot afford to let a cow go dry three or four months in the year. We must educate our heifers up to that. If you have a cow that will not milk ten and a-half or eleven months in the year, you had better get rid of her. In the winter time you should have more time to attend to the cows than in the summer. In July and August especially, the product is worth less than at any other time in the year, and we are generally busier then than at any other time. We all feel better to have our work

every day the year 'round. Our most progressive farmers are following that practice. Some one asked if it would not reduce the price of the product if we were all to go into winter dairying. There is no danger of all going into it. The majority of farmers never attend a Dairymen's association or a farmer's institute. Some of them would not do anything different from their grandfathers for anything in the world. A man said to me not long ago that he never took any paper but the "Pennsylvania Farmer," and that it has never done him a bit of good. There are many things in the "Pennsylvania Farmer" that it would not do for us to go by, but it's editors don't write all those articles. What I mean is that we must not take all those things; we must use our own judgment. We can get very many good things from the Dairymen's association and the farmers' institutes. Why, I have gotten as good points from Brother Phelps as from any man I know, although I don't agree with him entirely, and I hope he will believe everything I say, because I know it is right, but I know he won't. There is one point in winter dairying that we want to look after. We want to know that we are feeding right. We want to know that we are doing justice to the cow and the cow doing justice to us. I have no Babcock tester, but I feel about as Brother Phelps said last night. I wouldn't be surprised if I have one before long. We should know just what our cows are doing. We cannot know unless we have a tester. I don't care what kind of dairying we practice, whether winter or summer, we should not keep a cow that loses us money. A good cow is cheap at any price, and a poor cow is dear if she is given to you. Some farmers say, "Well, I raise the feed; it doesn't cost me anything." All the feed we raise is worth just market prices to us whether you feed it or sell it. We have our labor in it.

Discussion.

Question. Can a farmer make more by dairying in the winter than in the summer?

Crooker. I said that he ought to dairy winter and summer—all the time. I started out with the assumption that the majority of farmers do not dairy in the winter. They let their cows go dry three or four months in the year. My idea is to have part of my cows come in in the fall, and if they are going to go dry let them go dry in July and August, when I get the lowest prices for my products.

Prof. I. P. Roberts. I would like to emphasize one point the speaker has made, that is, keeping animals in flesh. A year ago last summer we went some twenty miles from our place and selected a dairy of Jersey cattle. To one-half of these cattle, after they had been carefully sorted by weighing and testing the milk, we began feeding grain. The other half never got grain. We found at the end of the year, in summing up all things, that we only had half pay for the grain throwing in the manure carried to the pasture. In the spring we divided those cattle again and fed none of them grain, and I think every man in this audience could easily pick out the cows that had been fed grain the year before. The heifers we had not fed grain were little, scrawny things, and the ones fed grain were large, plump animals. When those cattle went to grass the next spring, the ones that had been fed grain showed an increase of from ten to twenty per cent. over the oth-

ers, from that surplus they had carried over from that summer's feed. I am not particular how long a cow milks, but I am very particular as to the amount of butter fats I get in a year. That is the only question I ask of a cow.

Mr. Crooker. If one cow produced as much milk in six months as another cow would produce in a year, I would just as soon milk that cow six months and let her go dry the other six months. With a cow of that kind, what time would you milk her? I want to milk her when labor is worth the least and when the flies will not bother her. You can keep them up in the winter.

H. C. Crawford. Would the cows give as much in butter fat if milked five, six, or seven months?

Prof. Roberts. I doubt whether we would ever be able to get a cow to give as much milk in six months as in ten months.

Mr. Crooker. My experience is that as a rule the cow that milks the longest is the one that does the best in the course of a year.

Following Mr. Crooker's talk Mr. T. S. Strohecker read a paper on the subject.

WHY DO WE NOT BUILD AS WELL AS WE ALREADY KNOW?

By Col. T. S. STROHECKER, of Cooperstown.

Man is constantly looking forward to new discoveries, improvements and methods, by which he may lighten labor, and enhance and improve his condition financially. Old methods are set aside for new ones, which in turn give way for more recent discoveries, which after a trial and boom by scientific writers, so called, prove to be worthless, based upon unscientific principles as promulgated and advanced by another class of scientific adepts.

Science and analysis are often at fault, often in conflict with nature. They often advance and advocate a theory until it becomes quite a fact, and those who are constantly on the outlook for new discoveries, invest their time and money in them, and realize nothing but disappointment for their pains; not content to build upon what we already know, they go back to old methods again, because somebody has given them a new name and boom, and we go the unceasing round over again until we are led to wonder what gullible creatures we are, and how fond we are of being humbugged.

I would not by any means be understood to inveigh against, or to decry any of the useful, labor-saving inventions which are based upon correct principles. No one appreciates more than I do the cheerful click of the mower and self-binder, doing the laborious work which the primitive farmer did, freely interspersed with the "sweat of his brow." Nor the sewing machine, to lighten woman's toil. But, too often the wife and mother is a poor, over-worked creature whose limit of vision seldom extends beyond the four walls of her home, vainly endeavoring to furnish the table and cover the other necessary expenses

of the house with the price of butter and eggs and poultry, and too often is denied even that.

If there is one kind of labor harder than any other, it is the attempt to compete with the modern conveniences of a regular dairy, when the only stock in trade is one to a half dozen cows; and the woman who attempts a work of this kind will find the chances of release from the cares of this world increasing much more rapidly than her bank account.

Notwithstanding the manufacture of butter on every farm, and its general use, few farmers' wives understand the importance of its preparation, or are unwilling to give necessary care in its manufacture; hence the condemnation and low price of dairy butter. It is a fact, however, that the best butter is made in the home churn, by an intelligent and painstaking dairy maid, and not in the creamery. Such butter has a delicacy of flavor which is impaired by wholesale manufacture by machinery.

A reformation in butter-making is demanded by the public, and is required for farmers' profits. But I very much doubt whether that reformation will be brought about by any new discoveries or inventions, but simply by improving, by building upon that which we already know.

There is not, and I fear never will be a royal road to profitable farm dairying. It must come through more care in the selection and breeding of our cows, more care in their shelter and feeding, care in keeping them clean and comfortable, more care and cleanliness in handling the milk and cream and churning the butter; in fact, it is no one thing, but care in so many little things that are absolutely necessary to success.

In my younger years I was engaged in the tanning business and learned that all tanners followed the same general principles in the manufacture of leather, but the diversity in the quality of their product was as great as the diversity in the quality of butter. I learned that it was no one particular thing well done that was demanded for the manufacture of good leather, but careful attention to every minor detail, in all its manipulations; to do exactly the right thing at exactly the right time, from start to finish, made all the difference in the world in the quality of the product. Just so in butter-making; barring the difference in temperature of water, there is positively no reason why our butter should not all be of uniform good quality, if we only built as well as we already know.

Many housewives are in the habit of using only a wire strainer to strain their milk. If those having common wire strainers would have a band made so as to clasp a cloth onto the bottom, they would be astonished how much filth is caught by this cloth after having passed through the wire strainer.

We hear and read so much about "winter dairying," that it pays so much better to make the butter when it brings a good price, as it does in the winter. I do not question that it pays better to sell it in the winter, but I do question whether it does not pay better to make it in the summer and sell it in the winter. I know men who have fed more into their cows in winter than they ever got out of them. What cheaper and better milk-producing food is there than grass? We are

told, however, that summer butter will not sell for near as much in the winter as that freshly made. In answer, I can only give the experience as practiced in my own family. We have been for the last twenty years selling our butter at the house to one man, with the exception of two summers that we sold the cream to a creamery. This man carries it and sells to regular customers at Oil City. Whenever the price goes below a certain figure, it is worked up into rolls, a cloth wrapped around each roll and put down into a barrel of brine as strong as the best rock salt can make it. When the barrel gets full, olive oil can be run over the brine, and the butter can stay there indefinitely, or until winter, if the price suits to sell, when it is either sold wholesale, or else in smaller lots to the same man along with the fresh butter we may be having, and neither he nor his customers can tell which from tother. If anything, the summer-made butter is preferred.

Our experience in patronizing a creamery the two summers was anything but satisfactory. For what is called a "gauge" or "space" of cream we were allowed the price of a pound of butter, and no more even with the oil test; and yet at the same time when we churned the cream we invariably got a pound and a half of butter to the gauge.

I repeat, the best butter is made in the home churn, by the painstaking and intelligent dairy maid, and not in the creamery, where there is no uniformity in the patrons' handling of their milk. Now, why is it that there is also so much poor butter made in the home churn?

Have we not been told time and again how easily milk is contaminated with the odors of the stable and milk-room? Have we not been told time and again, read line upon line, precept upon precept, all enjoining the most scrupulous cleanliness? Have we not been told to ripen our cream evenly, but not to hold it too long, to churn it as soon as it becomes slightly acid, to stop the churn as soon as it gets into the granular state, to work the buttermilk out of it, but not to work it oily? Yes. All these things, and many more, have been dinged into our ears so long that in our agony we exclaim, "Oh, give us a rest!"

And yet how many of us know that we know what we know? How many of us know that we do not know what we do not know, and how many of us build as well as we know?

When the long list of breeding, feeding and care of cows and their milk is read to us we are, in the language of the Holy Writ, apt to exclaim, "All these things have I observed from my youth up!" and yet always lack we the doing of one thing or another that is of far more importance to us financially than selling our cows and giving the proceeds to the poor.

I do not pretend to say anything that would be of any interest or benefit to the creamery, or large dairyman, but only to those situated like myself, with only a half dozen or so of cows along with general farming.

View the matter from whatever standpoint we may, we keep just enough cows to make our lives and the lives of our families nothing but a continual round of drudgery. Instead of making a specialty, and doing one thing well, we attempt to do too many, is one of the reasons why we do not build as well as we already know. All that we

can hope for is that through these associations we may gather from and impart to each other some knowledge, and to make them reminders to us, to practice more carefully and build upon what we already know, for unless we devote our whole attention to the business we need not expect any great degree of success financially. We do not keep cows enough to make it pay to buy and run a power separator, and we keep too many to do the drudgery by hand, and farm besides.

Does the dairyman need any legislation?

Yes and no. I think so far as the Oleomargarine laws are concerned, a more strict enforcement of what we already have would be sufficient, as the anti-option bill has been passed, and with the promised tariff reform, we ought to have no reason to find fault. There is, however, one crying evil that vitally affects this Association, together with all the farmers in this commonwealth.

Let me draw a parallel: The Adjutant General's report of the doings of the Pennsylvania militia is published promptly, as soon as the season of the annual inspection is over; whilst the doings of the farmers and dairymen are delayed nearly two years before they are published. Why is there so great a difference between the two? Simply because an amply sufficient sum of money is appropriated annually for the commonwealth's soldiers, and only a paltry, pitiable sum is begrudgingly doled out for her farmers.

Oh, shame! Are not her farmers as of much consequence as her soldiers, that they must wait two years, until they become stale, before the proceedings of their meetings are published? I used to be a soldier myself, and know just how much good it does the people to know what companies in a regiment have placed to their credit the perfection inspection mark, and how many men in a company can qualify as sharpshooters. But I am also a farmer, who keeps a few cows, and I want to keep abreast of the times. If any new idea or theories are advanced in the State Board of Agriculture, or Dairymen's Association, I have a right to know it, without having to wait two years for it. I think this injustice ought to stop. The day of machine politics and class legislation has gone by. The day of reckoning has come. You farmers of Crawford and Erie counties have learned to know what you can accomplish when you all pull together. You learned to know the power of united effort when you elected that friend of the farmer, Honest Joe Sibley, to Congress.

You builded well for the dairy interests when you elected a dairyman and ex-president of your association to represent you in the district once represented by the champion of the Oleomargarine law, Wm. L. Scott. You have but to make your wants known and to sustain him, then you have nothing to fear.

Pennsylvania is not a very prolific mother in rearing a crop of very eminent statesmen. About the time they begin to learn to know the wants of the people, and are accustomed to make themselves heard and useful, she retires them. 'Tis true there is a vast difference between getting a "pull" on the confidence and affections of the people, and a "pull" on the teat of the political machine, where it takes "heaven and yarth" to make them let go their "holt."

The will of the people amounts to nothing unless properly expressed

and backed up by united and determined effort. You have learned to know this, and set the example for the rest to follow.

Let the good work go on, keep the ball a rolling, like your own Lake Erie's billows, until it may roll over every hill and dale, and every village and hamlet in this broad commonwealth, and forever crush out everything that comes between the people and their rights, and emancipate every political machine cursed and boss ridden farmer in the land.

Then they will rise up and bless you for having builded not only as well but very much "better than ye knew."

Discussion.

A. L. Wales. I supposed our friend would have something at least strictly modern in the line of dairying and butter-making, but I was mistaken. The fact that all the good butter was made on the farm is not a modern idea; that the dairy-maid makes the butter is not a modern idea; that the buttermilk should be worked out of the butter is certainly not a modern idea. The political issue at the last is strictly modern. We can take our choice.

Monrad. I was waiting for Mr. Crooker to defend himself. I must agree with the last speaker. To recommend to farmers of to-day, who have five or six cows, to make their butter on the farm, is certainly not building as well as we already know. It is true that the best butter can and should be made on the farm; but, let me say to Mr. Strohecker, that, if he and his wife will expend the same amount of care that is necessary to make that fine butter on the farm, on the production of pure sweet milk or cream, and put it in the hands of the creameryman, he will be able to make as good butter as they ever did on the farm. The trouble with the co-operative creamery is, that the farmer thinks that, as soon as he brings his milk to the factory, his work is done and his responsibility ceases. If you can make the farmer see that his responsibility does not cease until that butter is eaten, we can make just as good butter as they ever made on the farm, and we can secure a far higher price in the open market when we have a hundred tubs of uniform, good butter. I was disappointed to hear our friend recommend to the average farmer to go back and make his butter on the farm. I should be sorry to have the daughters waste their time on the product of those cows. If I had 40 or 50, I would certainly make it on the farm, if I had some one in the family to attend to it. Now, about this question of winter dairying. Is the oil or fat referred to of more value in the winter than in the summer? No. Then I contend that your comparison is away off. Elgin butter marketed last summer at 18 cents. It was put up for speculation, and there were sold, the other day, 6,000 tubs, at 20 cents. They take it out of the refrigerator and sell it for 22 or 23 cents, while freshly-made butter sells for 28 and 30 cents. There is a difference of five cents, at least, in favor of winter dairying. We must have warm buildings for our cows. If we build as warm as we know how, we will not have to shovel the corn in to keep the cows warm.

Mr. Strohecker. I do not dispute the gentleman's remarks about making creamery butter, but, I insist, there never has been better butter made than by the dairymaid in the home churn. I said the only

way we can improve is by taking more pains, being more careful. It doesn't pay to use those instruments you speak of when you have but two or three, or half a dozen cows; therefore, we are at your mercy when we take it to the creamery.

Mr. Monrad. You must have been very unfortunate. Allow me to say that we are away ahead of you in the West. I think my friend, Mr. Sutton, makes a difference between sweet and sour cream, of two cents a pound. He makes a difference in the quality of the cream of two cents a pound. What you want is to co-operate, and have a competent manager, instead of having a hundred small creameries. I am sorry to hear it advocated in this Association, in the year 1893, for farmers, who have from one to six cows, to make their butter on the farms. Because a few of you have been fooled into buying poor farm machinery, is that any reason why we should go back to using the cradle and sickle, instead of the reaper and mowing machine?

Mr. Strohecker. Should a farmer buy a Babcock tester if he has but five or six cows?

Mr. Monrad. The reports say eight; I say thirteen. It would be better to co-operate with your neighbors, and go to the factory.

Mr. Crooker. Mr. Strohecker is not in favor of winter dairying, because it costs more to feed cows in the winter than in the summer, and he thinks we should make our butter when food is cheapest. If we only want to winter our cows, so that they can live through, his plan is correct; but we must have good, comfortable barns, so that we do not need to warm our cattle with food. We have no business to have anything else. We need all the steam we can get. We need a reserve force all the time.

Mr. Strohecker. I doubt very much whether it pays better to make butter in the winter than in the summer. A cow should have a certain time for rest; let that time be in the winter.

Mrs. C. A. Stranahan. I want to say a word about co-operative butter-making. We have struck a very good co-operative plan in our neighborhood. We have a creamery near us that has done excellent work. If there has been any poor milk sent there it has been sent back. We are only making butter during about six and a-half months, which, I think, is wrong. We can just as well prepare to run our creameries in the winter here, as they do in the West. Our grain is higher, but other things would offset that.

In regard to the price, I think the least we got for our butter was 17 and 18 cents, and the highest, in the fall, was 28. Of course, during the season that the creamery runs, we do not make as much 28-cent butter as we do of the cheaper butter. We are agitating the idea of having our creameries open longer in the fall and earlier in the spring.

Prof. I. P. Roberts here read a paper on the subject "Foods, and the Part They Play in the Dairy."

THE EFFECTS OF FOOD UPON THE DAIRY.

Prof. I. P. ROBERTS, *Cornell University, N. Y.*

In studying the factors which go to make up success in the dairy, we naturally turn to three which stand out as most prominent: breeding, food, and environment. As soon as we undertake to discover what effect breeding has on production, we are led to ask the question, "How were breeds formed? What were the chief factors, or the one great factor which entered into the first cause which produced variation for the better, thus allowing the breeder to take advantage of selection?" It should be understood from the beginning, that the art of breeding is usually misinterpreted or wrongly applied. It is supposed that we would like to have a breed or variety of animals which would reproduce themselves with great uniformity; but, in fact, this is just what we do not want. What the progressive breeder desires is to produce variation for the better, and it is by producing variation from the original types that we secure any advance. If this be so, if we are all striving to produce variation for the better in our animals, we naturally ask the question, what factor or factors played the most important part in this uplifting of both plants and animals? If we take a liberal view of the question, we immediately discover that no nation or body of men have ever been civilized without improving its food; so no breed of animals has ever been formed, so far as we are able to learn, with bringing into play that most prominent of all factors, improved and more abundant nourishment. True, environment tends to change or modify the animals, that is, accelerate or retard the variation which constantly appears in all classes of living organisms; but I think, however, it can be clearly shown that, of all the factors which go to produce variation for the better, food is, by far, the most prominent. If we take the Shorthorns, for instance, of a hundred years ago, we find that the great uplift was produced by the introduction of clover and turnips into England. As long as the Ayreshire cow was fed on straw, she could never become a dairy cow, but, as soon as the turnip came, as soon as improved food was common in the locality of her nativity, immediately she, one of the worst-conditioned animals of all Europe, sprang into prominence as a milk breed. The Holstein cattle of northern Holland, put on superior qualities never dreamed of when they waded in the marshes of Haarlemmer Meer, and fed upon reeds and rushes. As soon as these lakes were drained, and the importation into the dairy districts of oil meal from the United States became common, this breed of cows sprang into world-wide renown; and, when brought to the American continent and with a still more liberal diet, we find them improving in form, in color, and in the quality of the milk they produce. So, take the Channel Island cattle. This breed from a warm climate, naturally had soft, sparse hair, with thin skins, which showed under the slightest provocation of both food and environment. The island was depleted, to some extent, by the shipment of cattle and cheese, and the waste of manures in early days. A slight lack of phosphates thus produced a small-boned animal, but abundant and continuous feeding, aided by environment, in time pro-

duced a breed of cattle unexcelled by any in the world for the quality of their milk.

Leaving out the food factor in any of these cases, the breeds, or the characteristics of these breeds, become almost entirely extinct. Henry Clay understood so well the power that lay in the factor of food, that he always carried hay from his home farm to feed race horses, no matter how far they went, because, he said that no other section of the country produced hay so rich in the food elements which go to provide energy for sustained effort. To the peculiar characteristics of the food about Lexington, Ky., is due more than to any other single factor, more than to any other two factors, more than to all other factors combined, I believe, the fact that annually, at the small city Lexington, over \$2,000,000 worth of horses are sold. The quality of horses raised about Lexington could no more be produced upon the low land of Holland, than could the Merino sheep have been produced in the everglades of Florida.

Then the practical breeder likes, so far as he can, to first gather together the successes of others; that is, the successes that others have secured by the wise use of this great factor, food, and the other factors which go to assist and give energy and force to this one great factor.

Take the parents, even years before they become parents of the animals to be placed in the dairy. We find that food plays an important part in fixing upon these parents characteristics which may be valuable or otherwise. Take the sire and dam of the Jersey or Holstein calf, and feed them as beef animals should be fed, and copulate them years after this unscientific feeding has been practiced, and we already have variation, and that for the worse.

So, the first practical point is that the breeding stock of our dairies should be kept in the condition which is most conducive to the object for which they are desired, namely, butter fats.

The calf is born, and from the start it should be educated to put fat in the pail, not on the ribs. This is very largely in the hands of the feeder, and, no matter how slight the mistake in feeding the young calf, in after years, when this calf becomes a cow, and you endeavor to get the greatest possible net product from high feeding, this cow will look the feeder in the face and say, "When young you taught me to put the fat on my ribs, and now that I am old, I will not depart from your instruction." So, the next point we make is that the calf can be ruined by over-feeding, by under-feeding, or by injudicious feeding, before it has become a cow.

Again, having a two-year-old, with a calf at her side, the feeder may again mold this young calf-mother to suit his will, or he may throw away, by careless feeding, all that has been gained. In this critical period of the cow's life she is too often neglected, and neglect now means positive variation for the worse through all her coming life. Only a calf herself, she has produced a calf, and, in a few years, is called upon to build a second embryo young. Meantime, the owner has taken advantage of all the force of inheritance that has gone before, and induces this young cow to give all the milk she can. Here has been a four-fold draft upon her constitution, and if she has a calf, and her ancestors have been fed and handled rightly, she will try to give her young life to her owner in the milk pail, and find an early,

consumptive's grave. If there are any specific germs taken into the system of this young animal while in this low state of vitality, it will be a physical impossibility for her to throw off or overcome adverse conditions.

Again, if this young heifer, in this critical period of her life, is fed chiefly on concentrated and heat-producing foods in large quantities, she becomes feverish, and again variation and disturbance occurs for the worse. And so we have a third point, and one upon which not near enough stress is laid. This young heifer, at two years old, should, by all means, drop her first calf in the stable, and have the greatest possible attention, and be fed with the very best that the stable can afford. No pains nor expense should be spared until this calf-mother has become a cow, and has been trained to do the work of a cow in the best possible manner. If, for lack of food in the fall of the year, she is allowed to dry up at eight to nine months from the time she produced her last calf, we have another variation, and that for the worse; but suppose that the food has been so skillfully supplied, and in sufficient quantities, so that we may induce this young cow to give milk for a longer period than her maternal ancestors; then we have produced a variation for the better. And so, all along the line, there is not a single quart of feed, not a single pound of hay, not a single cubic foot of ensilage, but has tended to produce variation for the better or the worse, and which it shall be is entirely in the hands of the feeder.

A great deal of discussion has been had as to whether cows could be made to increase or diminish the per cent. of fats in their milk by feeding. I believe there is no more doubt that the feeder has, to a certain extent, and within proper limits, control of the amount of butter fats that the cow will produce. It is contended that, having a normal ration, the cow will then produce her inherited standard of milk; but we have yet to learn what a normal ration is. When we turn our cattle out to grass, we find the amount of milk increases and the per cent. of butter fats also. Though the animals, during the winter months, have been fed liberally, on a most carefully compounded ration, and with a portion of their food in a succulent state. If we can develop, during the lifetime of the animal, that is between its first calf and its last one at ten or twelve years of age, no variation in quantity or kind of milk, or in size of structure, then, indeed, we are shut up to very narrow limits. But this is not so, for no intelligent dairyman now goes deliberately at making tests with a large number of animals, which are to be published, without first feeding his animals for a year, at least, with a view to making them vary for the better, and he is certain that if he does this feeding judiciously that the animals will respond, some more, some less. True, he tries to improve environment, but the improvement in environment may be considered as simply giving better opportunity to the food to do its normal work. Food plays such an important part in the dairy, that great emphasis should always be laid, not only upon the kind of food, but upon the quality of it. We have yet much to learn in regard to the important part which the volatile oils and aromas of the cattle food play in the quality and character of the milk. The human race has been taken from a barbarism in which man was nearly as low as the beasts of the

field, and, by steadily improving the energy-producing power of the food, by improving its quality and maintaining a steady supply, he has been raised to that point of civilization where he can command dumb wheels and cranks and levers to regard his thoughts; aye, even the tone of voice, the identical speech that comes from his lips, and transmits this speech, with no tone lost, to thousands of generations unborn; or, in other words, by improved food, which gave man the power of civilization, we are now able to give our children's children to the tenth generation, the pleasure of listening to the kindly voice and wise words of counsel of their ancestors which preceded them by more than a thousand years. What a miracle to take sound and reproduce it in all the after ages; to fasten lights and shadows, and perpetuate them forever, and this can only be done by nations which have been civilized by food. Tell me what a nation eats, and I will indicate the exact state of civilization to which that nation has attained. Tell me what a breed or variety of cattle is fed, and I can indicate, almost to a certainty, the kind and quality and quantity of the product. Because food dominates even to-day so largely that it is really the great factor of production; and this is true as well of the thoroughbreds as of the mixed cattle, because thoroughbreds are simply the product of concentrating the result of food that has been given. They could not be thoroughbreds, that is, they could not have extraordinary qualities or characteristics in one or more lines, unless they had had extra food, and so all there is to thoroughbreds is the food and the skill with which each has been fed through the last century. Let me make myself clear. I do not say that environment and climate have not played an important part. I merely contend that environment and climate and the like, are simply factors which retard or help to give force to that one great factor, food; for all flesh is grass and all food is grass.

It may be said that if food is so all-powerful that we may go on by scientific feeding until we produce an animal that is as productive as the best ones now bred. On the other hand, it must always be remembered that all laws have their limitations, and he who seeks to take the law out of its natural limit only disturbs the law of reasoning. Just where the limits are of the minimum or maximum in any law no one can tell. Just how slow a railroad train may be run and still move, or how fast it may be run by the most scientific application of energy, no one can tell. If food, then, plays so important a part, it behooves us to immediately discuss our subject from the standpoint of the quality of the food, and also the relative amount of heat producers and flesh producers which it is best to give to the animals. If they are kept in warm stables, and under our best conditions, we feed a ration to animals which have not been bred excessively to the dairy type, on a ration composed of 1 part of albuminoids to 5.4 parts of carbo-hydrates, our animals will tend to become too fleshy, unless somewhere during the summer, or at some other time, there are counteracting tendencies at work which shall resist this variation for the worst. So it is of the utmost importance to change the general character of the food if the stable be very warm, and make the ration narrower, say 1 part to 4.5 parts instead of 1 to 5.4 parts. Again, if the environments are cold, and the animals are inclined to put all of their

fats in the milk pail, we feed a ration even as wide as 1 part to 6, and this would be more profitable than to feed one richer in albuminoids. Again, if we are to produce energy, we should do it at the least possible consistent with the other factors; and so we find, as a rule, that carbo-hydrates produce about twice as many units of heat or energy as albuminoids, and, since albuminoids are worth as much, and often twice as much, per pound; then it is bad economy to feed a ration too rich in albuminoids.

Again, water is the vehicle which carries all things into and out of the circulation, and if this be wanting, even in a small degree, then all of our well-laid plans are destroyed. First, the animal deprived of a sufficient amount of water will not consume as much food as it should, because there is nothing to carry it into the circulation, or to carry the effete matter out of circulation, and so the utmost care should be taken, not only to provide an abundance of water, but water that is palatable, water that, from the fact that it is pure or sparkling, is relished by the animals.

Then, too, in order to produce variation for the better, we are always aiming to get the animals to eat and digest more than they have hitherto done. In order to do this we must, of necessity, in some way or other, excite the digestive or assimilative organs; but, if we do this, we are likely to weaken the power of digestion rather than to strengthen it; but if we can produce foods of high aroma, and preserve that aroma in the foods until it is fed to the animals, then we have the most healthy and the most perfect stimulating energy that it is possible to produce. Possibly, the only real objection to oleomargarine is, that it lacks the volatile oils of first-class butter, which assists the stomach in digestion and assimilation.

AFTERNOON SESSION.

Remarks on the Death of John Cole, one of the Founders of the Dairy-men's Association.

Wm. George. Mr. President, I have been called to make some remarks on the death of John Cole. I am glad that I have been called on, but I am sorry that I cannot do the man justice. I probably know as much about John Cole as any man now living. We played together as boys; we chopped together; we logged together; and, after we became men, we continued that intimacy. John Cole, with two or three others—J. Blystone and Adam Sherred—were the founders of this Association.

The first meeting was held in Venango. I think some of the brethren from Meadville—Fuller and Magaw—came over and helped us. After the meeting was held there one year, it was moved around to different places. I think the next year to Cambridge, and then to Conneautville, and John Cole was always ready to help it along. He

was not born with a silver spoon in his mouth, but he was very industrious, and left a large fortune, for a man who started with nothing but his own hands.

He was a man of sterling qualities—such qualities as we can all pattern after with profit. Honest to a fault, true to his word every time; just such a man as we should honor. After this institution had run a year or two, he was made president of it, and held the office, with honor to himself and profit to the Association, as many of you know. I am sorry I cannot say more in regard to John Cole. Not being a public speaker, I cannot say as much as I should. I can only say that any man that patterns after John Cole will not go far wrong.

L. C. Magaw. I am not able to say as much as our friend deserves. I can only testify to the sterling qualities of his character, his good nature, and kindly remarks as a member of this Association. His memory will always live in the hearts of the people with whom he associated.

Geo. Spitler. Mr. President, it would be utterly impossible for me to do justice to the memory of Uncle John Cole, as we were all pleased to call him, and I am sorry that I have been called upon. It is true that I had a very intimate personal acquaintance with him, and to know him was to love him. As a citizen, he was always ready to do his duty. He was one of those men who are never afraid to show their colors, and stood for the right as he saw the right. Just a short time before his death I was with him, and he inquired then after the members of this Association, and urged me to secure for him the address of one of the organizers, showing that, on what proved to be his death-bed, he thought of the members of this Association. I have not the ability to do justice to the memory of John Cole. I can only say that, in his death, our township has lost one of its best citizens.

B. Culp. I enjoyed the acquaintance of John Cole for forty years. He was the man who introduced Holstein cattle into this section. He was a man in all his dealings, and always a good neighbor. You could depend on John Cole. If a man was in a strait, he would help him out if he possibly could. We have lost a good citizen.

The matter of the dairy exhibit at the World's Fair was then discussed.

Mr. McLaughlin. I want to call the attention of the Association to the subject on which I was appointed a committee, in relation to the exhibition of the products of the State Dairymen's Association at the World's Fair. I find, by inquiry of Mr. Monrad, that the dairymen have a building there for the special purpose of exhibiting the dairy products of the different states; and, in that building, refrigerators are provided, and the space in those refrigerators is to be sold to applicants. I learn from the same source that the cheese states will, perhaps, make arrangements there to exhibit the cheese of '93 and the cheese of '92; and they will exhibit the product of each month of the cheese-making months during the season of '93. Now comes the question of finance. This cannot be done for a song; it cannot be done by any one individual. It can be done by the State Dairymen's Association, but it takes cash. What I want to call attention to is the method to raise the cash, the method of getting the appropria-

tion. We have no hope of getting it through the State Commission. I understand that this, being a manufactured product, that they have no appropriation for us. If this is true, we will have to raise this either by individual effort, or from the appropriation of the Legislature.

Mr. Spitler. We have members of the Legislature present, who, I think, can tell us whether there is any likelihood of getting anything from the Legislature. The first thing is to know whether it is constitutional for the Legislature to grant the appropriation.

Mr. Crooker. I got a pointer last evening from a lady. She got a pointer from another party, and this party told her where to get it. She said that our best course was to send directly to the Governor of the State, and get his signature for the appropriation; and, if he would give his signature for the appropriation for this purpose, there is no doubt that the Legislature would appropriate this fund. Maybe we could do something by taking that course. Ask for the appropriation, send directly to the Governor and get him to sign it, and get his permission for it. Maybe it would be a good idea to get the ladies to join, and get them to ask for us.

Mr. Phelps. It strikes me that we shall have to apply for it. I don't believe we can raise the funds individually to apply on these individual exhibits. Pennsylvania has made an appropriation of \$300,000 towards the exhibit of this State. It looks to me as though the dairy interests were getting the go-by. It is partial towards the other exhibits to leave the dairy exhibit out, which, I consider, is one of the most important interests of the State. The right way to do it is to ask for the appropriation from the State; then, you know, if they don't grant it, we can elect men who will grant it some day.

Mr. Crooker. If there is anyone here who knows what is needed to represent us properly there, let him state what it is.

Mr. Monrad. I am astonished that none of the members of the State commission have shown interest enough to be present here. In Illinois, out of \$800,000, not one cent is appropriated for the use of showing butter. In Indiana, the secretary of the state dairymen's association has been appointed dairy commissioner, and has been authorized by the state commissioner to grant sufficient space in the refrigerators, and to have whatever butter may be sent, taken care of properly by some one sent for that purpose. You can figure out what it will cost to keep somebody there six months. Out of an appropriation of \$300,000, \$5,000 is a very modest sum for the dairy exhibit. Even if you are not called a dairy State, I think the facts of the case would prove otherwise. I think you should appoint a committee to confer, first with the commissioners who have control of this \$300,000. If they will not listen, you have with you Mr. Sibley, who, no doubt, would help you to get a special appropriation for that purpose.

Mr. Critchfield. You never will get it under the sun if you don't ask for it. You never will get legislation unless you ask for it. You cannot legislate money into men's pockets. You never will get any of this appropriation unless you ask for it. I have been told that a member of the State Commission of Pennsylvania says that we are not a dairy State; that we have given our attention to other matters, and that we have no money to spend as a State on dairy exhibits. The

statistics show that we stand about fourth in the United States in the value of the products of our dairy. I move you that you appoint a committee of three, to confer with the World's Fair Commissioner of Pennsylvania, asking that an appropriation of \$10,000 be made.

Mr. McLaughlin. We will accept that resolution, with the consent of this gentleman, and present it to you as our report. I don't know how we can do any better. I want to get the opinion of the people here. We will make that resolution our report, with the consent of Mr. Critchfield.

The resolution was adopted.

R. L. Cochran. I think it would be pretty cheeky to go and ask for an appropriation now.

Mr. McClintock. We must now discuss holding the Dairymen's meeting at Conneaut Lake.

John S. Kean. There are many reasons, in my opinion, why a meeting of this Association would be very profitable, held at Conneaut Lake sometime during the summer. The winter season is rather a bad time for many farmers to leave home to be gone two or three days. In our section help is very scarce, and it is almost impossible to get a man to come and take care of your stock for three days. At Conneaut Lake, the Exposition Company has provided every convenience for this kind of a meeting. The buildings are large and commodious. Night meetings, as well as day meetings, can be held there comfortably; and the grounds are very pleasantly located, as many of you know. The grounds are well supplied with water for both man and beast. Accommodations can also be provided as to sleeping apartments, &c. It seems to me that there is not another place in the western part of the State so well calculated for this meeting, as the Exposition grounds at Conneaut Lake. The facilities for getting there are very good. No charge whatever is made by the Exposition Company for the use of the grounds.

Mr. Crooker. I would like to ask Mr. Sibley what season of the year he thinks most proper for holding this meeting there.

Mr. Sibley. Some time when it would be possible to leave the active duties of your farm work, and not conflict with agricultural fairs being held in the fall of the year. I would say to have it at a time when we could have the milk there, and have it go through these different processes in our presence, and have cheese made by one who is an expert in the business. By having these demonstrations, we would get this knowledge through two senses instead of one. Now we hear; then we would both hear and see. By holding this meeting there, the usefulness of this Association would be very greatly enhanced. I have understood that the management will do everything in their power to make a meeting there a success; and I have understood that they will even give special rates and reduced fares, if the farmers would go there. I hope the committee will take this in charge and make a success of it.

Mr. Crooker. The first of September would be the proper time to meet. I move you that we hold our next meeting at Conneaut Lake, and the time be left to the executive committee, as heretofore.

The motion was seconded, and opened for further discussion.

Mr. Phelps. I say it is not right to go there. What is this Associa-

tion for? Is it to go there and have a picnic? Do we get the appropriation for a great crowd to go there to get the benefit of instruction in agriculture and dairying? How many men who would go to that meeting, if we have one at Conneaut Lake, will take any interest in agriculture? I don't believe I can consent to the idea of leaving this place, and going out there at that time of the year. I believe it will be a grand mistake. We don't care about big crowds; we want the agricultural class—the men who come there to learn—who come there for improvement in the dairy business. I would rather have one man go there to learn, than a whole house full who go only for a good time. He is of more benefit to the Association and the dairy interests of Pennsylvania. Just as soon as the word gets out that we are going to remove the Association from this city, and build up another institution, we are liable to have the appropriation taken from us, and then the Association will go to the wall. We think here in Crawford that we are solid, but let me tell you that that appropriation is in the balance and may go against us. In the other end of the State this Association is spoken of as the Meadville, Crawford County State Dairymen's Association. Beware what you do, because we cannot live as a Dairymen's Association if that appropriation is taken from us. Those fellows on the other side are jealous. We must well consider the point about that appropriation. We may try to elect men who will aid us in getting a larger appropriation, but we had better keep still, or we will lose the whole thing. As long as we can keep this thing here, we can make it a live Dairymen's Association.

R. L. Cochran. As far as we are concerned, we would just as soon go to Crawford as to Erie. I was interested in Mr. Phelps' remarks, and I want to see Mr. Phelps' farm, and see that separator work. As I understand this, it is simply a request that the committee do what they can.

Mr. Martin. I am in favor of going to Conneaut Lake for a summer meeting, but not to give up the meeting in this city. The first of September, or the last of September, will likely conflict with fair times.

Mr. Schutz. It strikes me that this is the wrong time of the year. That is, when the factories are in full blast, and I do not see how a man can leave his work and go to a farmers' meeting.

Mr. Crooker. This resolution doesn't say that we shall meet. It is left to the executive committee to say when we shall meet, and to set the best date.

Resolution read by secretary and adopted.

Two specimens of butter were shown by Mrs. W. Dart, of Hayfield, and a committee, consisting of Profs. Roberts, Monrad and Gurler, appointed to decide which specimen was June butter and which winter butter.

Question. Is there such a thing as clover sickness?

Prof. Roberts. As far as we know, there is no such disease as clover sickness.

Question. At what time would you cut clover?

Answer. I cannot tell. You must be governed by the weather a little. If I see the weather good, and the ground dry, and the clover not quite ripe, I would like to have it go a little longer.

Mr. Sibley. I have seen clover hay kept as green to the eye, and the

aroma as perfect, as the day it was put in the mow. I think if Prof. Roberts could make it clear to the farmers of this section how they may cure their clover hay and take care of it, so that we can open our mows in such form as that, he will have done more than to show us where we might open up a small-sized gold mine on our farms.

Prof. Roberts. I would like to have some grass with my clover; that would hold it up so that it won't lie down on the ground, and the lower leaves rot off. I want the Eureka mower to cut hay with, and I don't want anybody to go in there with a hay tedder and knock the leaves all off it. I don't want it kicked and cuffed around. We have a good hay tedder. I used it a year or two, and the weeds are growing around it by the blacksmith shop. I never brought it back.

The hay tedder men will ted me all over, but that is my opinion. But you may buy just as many hay tedders as you want to. I do not like to cut hay too green. After the dew is off, about 10 o'clock, begin; and I would like to cut it when the ground is dry and the sun is bright; and the next day I would like to put it up. Leave it in the dew all night; it won't hurt it much. The next day I would put it up in small bunches, and put it up when it is hot, not when it is cold. Quit at four o'clock, and go home and milk the cows, so your daughter and wife will not have to milk them. The next day I would milk the cows in the morning before I went to the field. I would stir the hay lightly, gently, with a fork, because I want those leaves. I wouldn't shake it all to death. Just as soon as you think it will do, get into the mow, and pack it down just as hard as you can pack it, and put on some salt. Salt holds the hay from heating so rapidly, and, therefore, it doesn't mold, and the moisture is driven out slowly. That is as nearly as I can tell you how that hay is put up that Mr. Sibley speaks of. Use two or three quarts to the ton of salt. It holds the heat from developing rapidly, and thus keeps the hay from moulding.

Question. How long do you leave it in the bunch?

Answer. I would prefer to get it in the next day after it is bunched.

Mr. Monrad. What are you doing with my girls?

Prof. Roberts. It takes about twelve years of our lives to get any sort of a sprinkling of an education, and it takes about eight years of our lives to get started to grow, and that means twenty; and then our daughters are ready for the responsibilities of life, and, as the mothers of the future generation, will find their duties in the house and not in the field. Care for her tenderly, use her gently, just as I have asked you to care for the young mother of the calf. She has no business to go into the labor market of the world and crowd out some poor foreigner who wants the work, and needs the pay that comes from that labor.

Mr. Monrad. I am glad that you used that word "foreigner." I am quite willing to accept it. I like to talk this matter plain. It sounds nice to place our ladies up on a high platform, and make playthings of them; but I want to develop my daughters properly, and not have them look to marriage as the only lot in life. I want them to be independent of marriage, so that they will not be tempted to go into marriage merely to get homes. I am not talking about rich girls. I grant you the twelve years for an education, but how many of our farmers can afford to give it to their daughters? It is these girls that I am

talking about. I am not talking about my wife. My wife had enough to do in the house. I am talking about the girls who would get offended if you would ask them about anything on the farm. If we would teach our men to look down upon such girls, it would be a better work. I want my girls to be just as independent as a man, so that when he comes to her and wants to marry her she is not selling herself for a home.

Mrs. Helen Johnson. I would like to say a word. I think mankind in general has been looking upon woman from a mistaken standpoint. A few hundred years ago, a body of learned men met together and asked if women had souls or not. They did not ask her whether she wanted a soul or not. That body of men decided, fortunately for us that she had a soul. A few years ago, in the state of Massachusetts, they undertook to decide whether a woman was a person or not; and again they did not ask the woman whether she wanted to be a person or not, but they decided that she was a person. They have only one more vote to take, and that is to decide whether we are citizens. But some day you will let the women vote; and some day you will realize that God created woman as the equal of man, with equal rights. I don't think you men are intentionally wicked in your treatment of the women folks, but you are ignorant.

Prof. Roberts. I think I have been misunderstood. I have been trying to fix it so that a woman can do just as she has a mind to. I always say to my wife, "Now, Mrs. Roberts, you do just as you have a mind to, and if you don't, I will make you." I have some daughters, and they have been taught to get their living, but I did not send them into the printing office or anywhere else. I did not send them into the printing office to follow that style of life. I go back to my old position, that our stables are not fit places for our wives and daughters. I do not think it is the place for a refined, cultivated, American girl, in the cow stable, milking. You must get the cow stable up or get the girl down.

Mr. Monrad. I visited Holland, and one might eat in many of those cow stables.

Prof. Roberts. We get a wrong idea about education. We have educated one man's head and another man's hand, and made two monstrosities. To-day we educate the head and hand simultaneously. We are on the eve of a great revolution in the methods of agriculture.

Mr. Crooker. I have two girls at home, and they help do the milking; they take an interest in it, and like it. They help feed the cows, and, after a few years, if they happen to have homes of their own, I think that they will find that it was a very good idea to learn to milk while with me. I think if our girls would do a little more outside work, it would help to develop them physically, mentally and morally. I don't see why it is any worse for our girls to go out to milk than for them to go out to feed the chickens. Any lady would think it was an honor for her to go out and help her husband milk, when it is necessary. If it hurts them, or has a tendency to disgrace them, then, I say, don't let them go there. But it doesn't hurt them. They like to go there. It does them good.

Prof. Roberts. I think we are firing at cross purposes. I think that there is nothing that is menial, if it is well done. I would not

have any objection to my daughters milking, or learning how to milk; but, ordinarily, there is enough, or too much for a woman to do in the house, and I think it far better, under ordinary circumstances, for her to take that higher path in life. My mother milked cows, and my sisters milked cows.

The question box was opened, and several questions answered by Prof. Roberts. The ensilage question was discussed. The silo had been far from satisfactory to Prof. Roberts. He said if his wife did not succeed any better in keeping fruit sweet that she canned, than he did in siloing his corn, he would go to Chicago. Prof. Gurler said if he was planning for buildings on a farm, he would just as soon think of doing without a house as a silo.

After the questions were answered, Mrs. Helen S. Johnson, of Corry, Pa., read a paper on

THE BENEFITS TO BE DERIVED BY WOMAN'S ATTENDANCE AT THE STATE DAIRYMEN'S ASSOCIATION.

"Fair are the flowers and the children, but their subtle suggestion is fairer;
Rare is the rosebud of dawn, but the secret that clasps it is rarer;
Sweet the exuberance of song, but the strain that precedes it is sweeter;
And never was poem yet writ, but the meaning out-masters the meter."

And in the same way, Mr. Chairman, is this paper deficient. There is enough to be said on the subject, there are thoughts enough in my brain, but I lack the power to express them.

When God created woman as a helpmeet (or fit) for man, as we are told, I doubt not he fully understood his purpose, and was able to accomplish it. And, as he did not specify any particular time or place when she was to help him, it is reasonable to suppose he considered her a helpmeet for him on all occasions. And it is well for him at the present time if he, too, considers "it is not good for man to be alone," for he has few opportunities for being so. Yet women are at the State Dairymen's Association by men's invitation, and we sincerely hope we may be a help in the work. Those men and women who think that woman was created for a slave, servant, or pet for man, not only fail to understand God's plans, as shown by his work, but wholly fail to understand woman's nature. Every woman, as well as every man, has to work out alone, in one sense of the word, her own destiny. Alone, they come into the world, alone, they pass through the shadow of the valley of death, and, alone, they must bear the sorrow and grief that is a necessary part of human life, for there is truth in the poet's words:

Laugh, and the world laughs with you,
Weep, and you weep alone;
For this grand old earth must borrow its mirth,
But has sorrow enough of its own."

So she has need to learn to think for herself, act for herself, and learn self-reliance and self-support day by day, for, we all know, there is nothing of any value acquired in a moment.

The farm home comes, in one sense, the nearest to being an ideal home. There they must all work together for a common purpose, if success crowns their efforts. The farmer's wife not only has to care for home and children, but has to do her full share in caring for the products that are manufactured on the farm; yet here she hasn't perfect equality, and we can never expect universal brotherhood, that grand ideal that is leading on the philosophers and philanthropists of to-day, until we have perfect equality in the home, until men and women occupy their proper positions towards each other, until justice rules the home, which is the beginning, as well as the resting place, the Alpha and Omega of all mankind. This Association should arouse thought and disseminate it, also. Mighty problems await solution—problems so great that it will require the united wisdom of men and women to solve them. As long as there are hungry, starving people in this fruitful land, with its vast amount of uncultivated acres, and its great numbers of unemployed hands longing for work, the farmers who feed the world should not rest until such things become impossibilities. Then, again, the farmer is both capitalist and laborer, or, rather, wealth owner and wealth producer, so should he be able to look at the great questions that now confront us as a nation, more fairly than those who are only one; and, by uniting the wisdom of the father with the love of the mother, we may be able to solve all questions with equity and fairness. In the mighty changes that are awaiting the farmers of this country, in the near future, woman's happiness and welfare are at stake the same as man's, and it is an impossibility for her to be a careless spectator, for no other hearts can feel more keenly than hers, the dread and fear that strike them when the oft-repeated questions are asked: "Whither are we drifting as a nation?" "Are the independent American farmers to become the tenants of a monied aristocracy and foreign landlords?" Terrible these questions may be, but not foolish ones, when the last census shows that, of the 12,000,000 homes in this country, 9,000,000 have mortgages on them. It seems very easy for the creditor class to talk of mortgages being a sign of prosperity, but very hard to make the debtor class believe it; they know too well what a mortgage on the farm means, as Will Carleton so truthfully pictures it:

"We worked through spring and winter, through summer and through fall,

But the mortgage worked the hardest and the steadiest of them all;
It worked on nights and Sundays, it worked each holiday;
It settled down among us, and it never went away.

Whatever we kept from it, seemed a'most as bad as theft;
It watched us every minute, and it ruled us right and left.
The rust and blight were with us sometimes and sometimes not;
The dark-browed, scowling mortgage was forever on the spot.

The weevil and the cut-worm, they went as well as came;
The mortgage stayed forever, eating hearty all the same.
It nailed up every window, stood guard at every door,
And happiness and sunshine made their home with us no more.

'Till with failing crops and sickness, we got stalled upon the grade,
And there came a dark day on us, when the interest wasn't paid;
And there came a sharp foreclosure, and I kind o' lost my hold,
And grew weary and discouraged, and the farm was cheaply sold.

The children left and scattered, when they hardly yet were grown.
My wife she pined and perished, an' I found myself alone.
What she died of was a "mystery," an' the doctors never knew;
But I knew she died of mortgage, just as well as I wanted to.

If to trace a hidden sorrow were within the doctors' art,
They'd ha' found a mortgage lying on that woman's broken heart."

So it is to be hoped that woman's attendance at dairymen's meetings and farmers' institutes will teach them some way to help lift the mortgage from the farm.

Then, in the mighty inventions that have come to the world in the last half century, the country homes have not received their full share of the benefits; and, perhaps, through a broader education, which these associations may help her to obtain, she may be able to help devise ways and means whereby they may be utilized in rural homes, and the telephone, electricity and an improved water system make country life more desirable and profitable.

Then, again, women have shown themselves possessed of a fair share of inventive genius. May not the institute, by stimulating thought, experiment, and research, enable her to invent some profitable use for the weeds of the farm, that now cause the husbandman so much trouble and vexation; the Canada thistle, and the milkweed in particular, whose beauty must commend itself to her artistic eye? Then, I believe they should attend because they represent the home (and what would the farm amount to without that?) and all that affects it, could be profitably discussed here. Tobacco is a farm product. Is its culture a benefit or damage to the inmates of the home? Should we allow the golden grains of the farm to be made into an alcoholic beverage to ruin the brains and morals of our children?

We are trying to learn how to produce the best beef, pork, and mutton for the least money. Would it not be well to give thought to the effect such food has upon the human race; for I hold that men are of more value than their money? And if the chemist who spent so much time and money trying to make an artificial egg exactly like the natural product of the hen, had tried to discover what was the difference in effect upon the human being who ate the egg or the hen, he would have paid his way in the world better. And these are subjects which women, as cooks of the family, are adapted to help discover. And many subjects which are discussed at these gatherings, such as laws relating to heredity, and the different constituents, and value of different foods, she, with her thoughts always intent upon home and

children, will carry home with her to be solved for the benefit of humanity, and again given out through the institute to find its way to many homes. Mothers, as the great teachers of farmers' children, need the freshest thought, and every hint and help obtainable to instruct and encourage their children to make agriculture pleasant and profitable, that both boys and girls can earn their living on the farm, instead of rushing to the towns and cities for employment. She, also, needs all the knowledge attainable to enable her, in case of sickness or death of the husband and father, to conduct the farming profitably, that she may not be obliged to leave it for other and, perhaps, less congenial work.

Can the wife and mother make the home attractive enough to keep the sons and daughters on the farm unless the farmer makes farming as profitable as other occupations? And is good, thorough farming profitable? And, if we do not retain a fair share of what the harvest yields, for home and children, is it legitimate and profitable that we discuss the ways and means to accomplish that desired end at the Dairymen's Convention? As it is claimed that women furnish three-fourths of the church members, and only one-tenth of the criminals, I hardly think she will lower the tone of the meetings; and, as they are conducted solely by men, the reasoning half of humanity, and woman being such an unreasoning being, it ought to be profitable for her to be here. In fact, I believe woman's attendance at dairymen's conventions and farmers' institutes one step toward that grand result of perfect equality, when justice shall rule the world; when we shall work for love of good instead of love of gain, and everyone shall do his share and receive his reward; when no one shall be obliged to work until the human form, fashioned in the image of the Master, shall be bent and disfigured with toil; when the farmers shall no longer be distinguished by their "horny hands," for all shall work enough to give their hands true beauty, and none enough to spoil them. And the farmer shall watch the golden grain and the luscious fruit ripen with more interest than ever an artist watched the glowing canvas spring into beauty beneath his brush; for nature's products will possess values that art can never equal. And he will know that the beautiful grain, grown upon the bosom of Mother Earth, watered by the rains from the wonderful clouds, kissed and strengthened by the glorious sunshine, refreshed by the dew and fanned by the breezes until it contains all the elements, and in the proper proportion for men's food, will never again be diverted from its legitimate channels; and by the abuse, not the use of it, scattering ruin and devastation over the homes of men, worse than any simoon of the desert. And the glowing fruit, as he watches it crimsoning under its canopy of green leaves, will not only feed his beauty-loving eye and soul, but represent strength and health, happiness and purity for earth's children. The animals that contribute to his needs will be sources of comfort then, not helps to debasement, for he will have learned to feed his spiritual nature more, and his animal nature less, and no longer take the life he cannot give. He will not only have conquered the forces of nature, and subjected them to his will, thereby bringing a higher civilization to man, but he will have done a nobler, grander work by conquering the greed and selfishness in his own nature, and by cultivating and

educating the better part, until it has become possible for us "to do unto others as we would others should do unto us." The law of the land will then have made it as easy as possible for people to do right, and as hard as possible to do wrong, and striven to do away with all that "maketh a lie," until people have become more civilized and able to appreciate a higher civilization. And so, whether he follows the plow through the moist, warm earth, with heart thrilling in unison with the glad bird-song from the tree tops, careful to sow only the good seeds, that will bring health and happiness; or, whether, in the autumn, he gathers in the harvest, rich with blessings, for his fellow man, his whole being in perfect harmony with nature, and his thoughts keeping time with the rhythm that bird and bee, stream and flower, hill and grove are forever singing. There is no "winter of discontent" to follow, for he has studied nature's laws from without, and listened to God's voice from within, until want and hunger, war and strife, sin and misery will have vanished, and "peace on earth, good will to man" be a surety.

POULTRY FOR THE FARM.

By Mrs. C. A. STRANAHAN.

The keeping of fowls on nearly every farm is the custom, and has been from time memorial; indeed, fowls and eggs have been used for food since the earliest history. I believe it is not known what people first domesticated them.

The French people, perhaps more than any other of this century, have made poultry raising a business, and we Americans will do well to study their methods. Poultry on many farms have been too long regarded as scavengers and thieves by their owners, and are expected to hunt their own living; but when they found a chance to take a square meal, they were pursued with great racket and oftentimes be-headed, with the same justice and kindly spirit that possesses people to hoard up great fortunes for themselves, while the pangs of hunger drive their fellow beings to theft, and the law punishes them for it. Perhaps we never think how nearly alike hunger affects us all, and that animals, as well as men, to do their best, must be well fed and cared for, and poultry, of all creatures, respond most quickly to judicious treatment.

Of course, the particular line of profit sought must determine somewhat the breed to keep, and the proper care to be given them. The one that breeds for exhibition purposes mainly, does not bother himself much about trying to establish good laying strains of fowls, but looks more to the style, carriage, plumage, &c., of his pets. Another, who keeps a great variety of pure bred fowls to supply eggs for hatching purposes, does not pay particular attention to the egg production of the different breeds, only to see that they are kept pure and true to name.

We believe that this has led to distrust of some of the best laying breeds. For there are some families of every breed that excel others in egg production; and to establish this, wise selection and liberal feed must be given.

So, when choosing what variety to keep, if eggs are the desired object, our plan has been to purchase stock of those interested in the same line of work or profit.

We have found, in our experience, that by keeping two varieties, one of the smaller and one of the larger breeds, we could suit ourselves and our markets nicely. We have always hatched our chickens with hens, therefore a variety that will lay early in the winter, and can be depended upon to sit as early as March, was necessary.

We find the Barred P. Rock to answer this purpose very well; for our main laying stock we have depended upon the Single Comb Brown Leghorn, which has been our favorite for years for that purpose. We have been experimenting the past two years with a cross of B. P. Rock and Brown Leghorn, and we are highly satisfied with them. They are very hardy, feather quickly, and make excellent broilers. They are color barred like the Rocks, with scarcely an exception. In size and shape their body is like Rocks, but their head and comb resembles the Leghorn, and they will reach laying maturity nearly as early as the Leghorn, but the eggs are uniformly brown. We have a neighbor who has a flock of pullets of the White Leghorn, Barred P. Rock cross which are beautiful. They are nearly as large as pure Rocks, of the same shape, but pure creamy white in color. They are laying about with pullets of the pure White Leghorn breed of the same age.

So, while we keep B. P. Rocks and Brown Leghorn and their cross, we do not say they are the best of all, only, they have done well for us. As all of the breeds have their admirers, and good results are obtained by crossing many of the larger breeds with the smaller, we will not urge the merits of any.

In regard to feeding, we especially urge a variety of bulky food, such as clover, cabbage, carrots, and potatoes, for winter ration. Seeing fowls picking grass and leaves so readily in summer when they can choose for themselves, should teach us that a wholly grain diet is not in accordance with their cravings, neither is it as economical in point of cost. Our method of winter feeding for eggs is a hot mash in the morning, made by heating in a large set kettle water enough for mixing the food for 200 hens, usually about two pailfuls. When hot, put in one bushel fine cut clover, let cook a few moments, then add of mixed feed made of corn, oats and buckwheat or barley, ground together with three quarts of animal meal till it is as thick as can be handily mixed with a shovel. Full all of this will be eaten up readily. Boiled potatoes, carrots or beets make an agreeable change twice a week in place of the clover. Cabbage, carrots or apples placed in the coop so the fowls can pick them raw, is a favorite way of making them active and bright, active fowls means plenty of eggs, while stupid, drowsy fowls means disappointment.

We have no floors in our poultry houses, only dry earth. This is cleaned out four or five inches deep every summer, and dry earth from some bank or knoll filled in again, with fine gravel added if con-

venient; over this keep cut hay or straw four or five inches deep, and you have the nicest kind of a play ground for your birds. Let all of their food after the morning mash be scattered thoroughly among this litter. For this we use wheat, oats and buckwheat, with a little corn at night as late as they can see to eat. Crushed oyster shell and clean water is always by them, and milk if you have it.

But success does not depend entirely upon the care you give your hens in winter if they have not been prepared for winter layers. By this we mean hens that have laid well one winter and through the following summer up to fall cannot be expected to moult and be ready to lay again in November, December or fore part of January. As a rule, of course, they will lay well after that, and so will every other hen, and down goes the price.

We aim to have early pullets enough to replace our year old hens every winter, and when we only kept 75 or 100 hens we did it. But, through the perversity of some of our sitters, we failed to hatch enough early, and other causes combined to prevent our raising but few early ones this year; so one-half of our present flock are year-olds, and we are more than ever convinced that we will not winter so many again. Of course, they have laid a little, but not nearly enough to pay for their feed; but if we had sold them before they moulted, the money they would have brought would have been nearly all profit, as the cockerels raised with them sold as broilers for nearly enough to pay for the food of both till the pullets began to lay.

We hatch and brood our chickens with hens, and would have every chick hatched in April if we could get broody hens enough then. We raise our chicks to four weeks of age on the "no water" system. Having become convinced that much of the mortality among little chicks is due to too much sloppy food, we have adopted the plan of feeding only a bread made of mixed meals, such as corn, rye and animal meal and bran, wet up with milk or water and baked. This is soaked up moist with milk or water and fed for the main feed with a little oat meal or cracked wheat for dessert.

The food being cooked and fed in this way makes it perfectly safe, and gives all the moisture the chicks require, only what drops of dew they drink in the morning; and does away with the drinking cup, which is nearly always more or less foul and impure, and, in our opinion, productive of much of the so-called cholera among little chicks. Many seem to think this depriving the chicks of water is cruel, and especially so to the mother hen when confined to the coops. We judge from the effect it has upon her, and we usually begin to find eggs in the coops when the hen has been cooped three or four weeks, and we know hens will not lay unless all the wants of nature are satisfied and they are in good condition; therefore, we do not feel that she suffers, although she will drink if water be given her.

We move the coops often to fresh grass until the chicks are four weeks old, when she is given full liberty with them all about the yards, and the food is given more of whole grain and less of the bread. Of course, fine, ground and crushed oyster shell must be supplied where they can get their fill. And as we are to profit by each others' experience, especially our mistakes, we will tell you where we believe we made a mistake; that was in allowing old fowls to run with young

chicks where large numbers are kept. We had 200 hens, 100 of which were allowed full range all about the place, our yards and buildings being so arranged we could not confine them all, but the results show it was a losing business, as the hens we confined in flocks of 15 to 18 in houses 12x12, with a run 12x125 feet, gave more eggs in proportion to numbers all through the summer, and began laying earlier in the fall than those left at full liberty; thus showing that full range is not productive of the egg yield, and also that old fowls interfered with the young chicks, and made the flock so large it was impossible to get the best growth in the chicks. Result of that—our pullets which we depended on for our egg supply in early fall and winter were immature and not up to our expectations, consequently did not begin to lay until a month or six weeks later than usual, which will largely decrease the profit from our poultry for the season. We believe the most profit can be received by the average person on the farm from their poultry by confining themselves to 75 or 100 layers. We say 75 or 100, while we believe much larger numbers are kept with profit by those who are making a business of poultry alone, or mainly. The point we wish to impress is this: we are talking from the "farm poultry" standpoint, expecting them to be cared for by the wife, daughter or son, who best likes the work, and that it will be done in connection with other duties; so we say, keep the number of fowls just what you can care for easily. Giving better care to smaller numbers will pay a larger per cent. profit per head than dividing up the care among more than you can do justice to, thus increasing the expense and decreasing the profit. Simply boarding fowls for their company may be all right if one can afford it, but we are not social that way.

We love to make our fowls happy. We enjoy taking a basketful of chaff or litter from the barn floor, carrying it into the coops and pouring it down on the ground to see the fowls scabble over the pile, looking for the grains of wheat or oats we had scattered through the heap, each one trying to sing the loudest; or to carry them a head of cabbage, which they will devour with as much relish as a child would an orange. In fact all these little things can be done easily if one has only five or six coops, but when the number is doubled you can only do half as well by them if your time is limited.

We do not wish to discourage those, however, who are planning to make it an exclusive business, for we believe if we were to take up any work individually to support ourselves, our choice would be poultry keeping. To our mind a snug poultry house, built 12 feet wide and long enough to accommodate the number of fowls you wish to keep, giving about 12 feet square to a flock of 15 or 18 fowls, building the runs directly back from each pen seven or eight rods, making the runs long and narrow, and the whole in a solid square, is the most economical as well as tasty manner in which one can build, if they have the right location.

We have only earth floors in our coops, and on our kind of soil they work well, and are desirable in keeping the temperature so the Leg-horn fowls will not chill their combs even in the coldest weather, which they are liable to do with board floors without artificial heat, which is not desirable. In the fall a trench is cut around the sides of the house and the earth is banked up to the sides to keep the frost

away from the bottom. But every one must be governed by the kind of soil, location, and breed kept.

Many of the ailments which poultry are liable to, such as cholera, roup, pip, or even gapes, are called contagious, which, in our opinion, is a mistake. There is one ailment to which poultry is often subjected that there is no doubt about being catching, and that is lice; and you can catch them in nearly every flock of fowls kept in the ordinary way; and we believe many of the ills of chickens, especially small ones, is due to the support of such numerous families of these pests upon their little bodies, which weakens them, and then a cold rain or chill does the rest.

To protect the chicks from these pests where the hatching is done by hens, the best method we have found is to sprinkle Persian insect powder thoroughly through the feathers down to the body of the hen and sift among the eggs and straw of the nest, and two or three applications are necessary to get the last ones, so there will be none left to start with the chicks.

One of the most harrassing pests to old fowls is the gray mite which is red when filled with blood, and which chooses the roost poles and nests for its home, and preys upon the fowls at night when quiet upon the roost or nest, but they are gathered in clumps in the matchings of the boards or roosts during the day, and are easily destroyed by a liberal use of kerosene, as you have all read many times, no doubt; but let me add, it must be done thoroughly or there will be enough left to continue business at the old stand.

Another parasite which gives the fowls trouble is the one which burrows under the scales of the feet and legs, giving them a rough, mealy appearance. They may be destroyed and the legs of the fowls so afflicted become smooth again by dipping the feet and legs in a pail filled with kerosene, holding them in a moment to allow the oil to penetrate and reach up to the hock feathers.

The three classes above described are the ones most common whenever fowls are kept in large numbers without constant vigilance; and, though none of them are considered fatal to fowls, they will, if left undisturbed, render any flock of fowls unprofitable, and so debilitate them that they fall easy victims to other troubles. The next, and by no means least enemy of the young chick is the gape-worm; and here a wrong impression often exists. I have had people say to me: "don't you think the gape-worm is caused by lice?" By no means. The gapes are caused by the presence of worms in the windpipe of the chick, and they are in no way connected with any form of louse, but are picked up from the ground. There are many theories concerning them and their habits, and I have never been able to find just how they get established in the windpipe of the chick; but this much experience has proven—when they get in a poultry yard, the chicks will get them every year, if cooped upon the same ground, unless it has been disinfected.

Damp, shady ground, and old chip yards, are especially favorable to the gape-worm, while dry ground, entirely exposed to the sun, is much less liable to produce them. In most parts of New England they are entirely unknown. I have never had any trouble from them until the past two years. While many ways of removing them from the wind-

pipe of the chicks have been suggested, and I have tried many of them, the most sure and satisfactory is to hang a piece of carpet over the coops after the chicks have gone in for the night, leave an opening to slip the hand through, take strong, air-slaked lime, throw it about in little clouds, letting it go among the chicks. It will cause a great sneezing and hustling while they are breathing the lime dust, but two or three doses will cure nearly every case. But that is for that brood only; it does not get at the root of the evil. To do that the ground must be thickly spread with lime all about the coops, which, I am told, has destroyed the worms entirely for those who have tried it.

And a word about the early chicks that should be hatched and ready to coop out as soon as the snow is gone. They are the cream of the business, and some of you may suffer from the depredations of hawks, as we have done, having had them take nearly all our early ones. We built little runs to set in front of coops by taking two boards twelve or sixteen feet long, setting them on edge, putting an end board four feet long in the one end. Take wire netting four feet wide and stretch over the top, fastening at the sides and closed end, setting it in front of the coops, letting the chicks run in it, and moving to fresh grass every few days. It was a perfect safe-guard for them, and they grew as well as those having full run; we kept them there till four or five weeks old, till the wild birds began to hatch and rear their young, when the hawks are not so troublesome, as they feed on the young birds. By the way, there should be bounties offered by the farmers for Sharpshin and Cooper hawks, as they not only destroy our chickens, but live upon the young of our best friends, the birds who do us such good service among insects and caterpillars, as well as to furnish us sweetest music, free.

Perhaps I have taken too much time with these seeming little things, but it is the attention to little things that means loss or profit.

I have been interested, when attending institutes, in listening to the brothers who have told us so much about the kindness, and care, and little attentions given to cows and stock, who could only look their thanks; but gave returns for it in better flesh and more butter fats. These were little things, too, but, taken together, they make up the whole of successful dairying, just as the thoughts and helps and hints we give our children day by day, help to mould and shape the forming character. A good book placed in the hands of a son or daughter at the right time, giving them opportunities to hear good speakers on interesting subjects, or reading to them a poem that expresses thoughts you could not frame in words—all these are the little things, together with what every child should have, plenty of good literature, that helps to develop that higher type of boys and girls this new era demands. It is the studying first to know what we want to develop, then follow lines that will be most likely to lead to that result.

Now, in closing, I would urge my sisters of the farm to take the care and management of the poultry to themselves when possible to do so, without neglecting the necessary work of the home.

I especially urge this work for women because it is out door work, and takes us out in the fresh air for some purpose; and when we get

interested in our birds, anxiously watching their growth, and providing for their wants, and they learn to look for our coming, and fly up to see what good thing we have brought them, and will give us a nice basket of eggs each day in return, the thought of dodging out between showers to feed them, or of facing a blustering snow storm for a few days does not stop us; we are so interested in our work; and the greater the interest the greater the profit.

Of course, for some of the heavy work that has to be done, the hired man or husband will have to lend a hand, which, our word for it, will be cheerfully done if you are in earnest and have the figures to show what a good profit the business is paying you.

We have a junior member in our firm, aged thirteen years, who does very many of the little jobs, such as cleaning the platforms, filling the water cups, and such light work, and has for his share the money for the eggs laid by his flock of twelve hens.

While we believe poultry farming on a large scale of thousands of fowls a very profitable business when located near a large city, our experience has been with farm poultry only, and in time we wish to stimulate a more extended interest, believing that one acre devoted to poultry, with their runs and coops, will not interfere at all with the other farming, and will furnish a product that always brings cash, at good prices, in all our local markets, and at a time of year when everything else is dull, they will gladden your hearts with winter eggs.

THURSDAY EVENING.

The evening session was called to order at 7.45 by President McClintock, after which Mr. J. B. Phelps gave a talk on the "Feed, Care and Management of the Dairy Cow," which was, in substance, as follows:

I propose to talk a while to you about as I would if you were in my barn and you wanted information. The dairy cow and her product is of greater interest than ever before in Pennsylvania, and I do not like to see the coolness of the treatment the dairy cow receives from the officers appointed as World's Fair Commissioners from Pennsylvania as her product comes into the family of every citizen of this State, from infancy to old age. We cannot get along without her; she must be here to help out the infant as well as the aged person. A great many people have an idea that if they fill a cow with food, that that is about all that is required. Every farmer here knows that it is only a short time ago that we found out how to make hens lay in the winter time. That is a great question. I have often remarked, "If my hens would only lay now, I would be on the top shelf. If they would only lay they would be all right." I would feed corn, and feed corn, and the result would be that I would not get any eggs. We found out that we must feed about the same substance that is in the egg to produce the egg. If we want milk, we must feed something to make milk.

You will not get it unless you feed something to make it of. The first subject to be discussed is feed. I presume a great many here will take exception to what I shall say, but the facts will stand up and wear out any false idea. Let us commence, in the first place, and find out what food is. That is the first thing to be considered. In other words, what must we feed to the cow to make her produce. In looking this thing up, and studying on it from a scientific basis (for science is the basis of everything we do), we have discovered some scientific facts. What is food, and what must we feed to produce the article we are trying to make? There are two constituents in food that you require to make what you want from the cow. If you want to feed for fat, you must feed a certain amount of carbon. If you want to feed for milk we have found that, as a general thing, that one part of albumen to five parts of carbohydrates makes a very fine feed. We should give our cows a change of food. When we sit down to the table to eat, we do not confine ourselves to one article of food. I never saw a man make a good, square meal on one kind of food. It is a very peculiar man who will do that. Bread is spoken of as the staff of life, and the most important thing to sustain life, but if a man would sit down to the table and eat nothing but bread every meal, he would be considered a very queer man. You must balance your ration. In cold weather you will have to have carbon; in summer you do not want the carbon. Everything in dairying is the cheapness of dairy food. You can feed a cow, and feed her head off, if you want to. In Crawford county the woods are full of men who are feeding the cows' heads off. I am not surprised to find people who think dairying doesn't pay. In my opinion, dairying will pay. Your cows are subject to your control, and your judgment must tell you what to feed each one of them. You must use intelligence to make dairying profitable. Feed the cow all she will eat and digest properly. Don't feed a cow light, and expect her to produce heavy. The cow retains so much for her support, the balance goes to you. If we have a boiler, and we will just feed that boiler enough to keep up five pounds of steam, you will find that that boiler is not going to do any work for you at all. You are wasting fuel. Put her up to one hundred pounds of steam, and she will do business for you right along, and do it easily. It is just so with the cow. If you start a boiler up in cold weather, you have to put in more fuel. If you keep a cow out-doors, you will have to feed her more fuel to keep up the proper amount of steam. I want to emphasize the warm stable. I don't believe dairying will ever be a success with any man who has a cold barn; and you may feed as much as you have a mind to, and you will never make it pay in a cold barn. The man who has not conscience enough to take care of his stock, will never make it profitable.

He has not interest enough in the business. "Care" is one of the greatest little words in the dairy. It would be right and proper for every dairyman, who has the interest of his business at heart, to write, in the largest letters he can find, right over his stable door, the word "care," so he can see it every time he goes past it. Care is one of the things that must be observed in the dairy business. How many of the dairymen here know that they are feeding the lice that are on the cows? No man ever made a cent of money in feeding lice. You can-

not make a cent in that way. They are not profitable creatures to keep on the farm; but you can get rid of the lice if you have a mind to. I can almost hear some fellow say, "How are you going to do it?" I have tried carbolic acid; I have tried tobacco; I have tried kerosene oil; but they did not work satisfactorily with me at all. It did not make a final extermination of the pests. I could scatter them, and make it lively for them, but I wanted to get something that would make them get right out of there, quick. I resorted to an expedient that I knew would fix them. I was a soldier, and knew just exactly how to fix that mercurial ointment. Get the ointment in a tin box; get a horse brush and rub it on the brush thoroughly. You won't want more than the size of a pea, or a good-sized kernel of corn. That will exterminate a great many million of lice. If you do the work thoroughly, you won't find any lice next day.

It is not necessary for me to repeat what I have said about keeping the cows warm. That is the first thing to be considered. Don't turn the cows out in the morning to water them. They don't want water. They want to stay in the stable, where it is warm. Keep the milk flow going all right. They are just like I am; sometimes I want to stay by the fire, instead of going out in the cold winter weather. Their business is to manufacture milk, and you must see that they do it. In regard to stabling. I said, don't turn them out in a cold day. A very good criterion to go by, if you turn them out, is to watch them, and, if they edge towards the stable door, you be there to let them in. They will tell you all about it. When they edge toward the door, let them in. If they want to take a little ramble and scratch their necks, and fondle one another, that is all right; but when they go to the stable door, you get there as quickly as possible and let them in. Prof. Roberts spoke about salting the hay, but I don't believe it is good for the cow. We have a large trough outside, and they have free access to the salt any day they are out. Horses the same; and, I believe the animals know their own business on the salt question. They have free access to good water. They want water just when they want it. Give them free access to good water. Let them have water right handy, and have it warm. It pays to do this thing, because it saves fuel. I am speaking more particularly of winter dairying.

Feed regular, and milk regular. Don't feed to-night at 5 o'clock, and to-morrow at 7 o'clock. Don't commence at one end of the stable and milk a cow and turn her out. Pick your cows in a string, what you want to milk. Make a division of your cows, and then let each man keep up the rotation. It pays to be regular in this thing. It pays to be on time just exactly with your milking. I have seen a cow, when we have been so exact in milking at the same time each day, that the milk would begin to start just as soon as I would get to her. They are a pretty good clock; they understand when the time comes. Be very careful to be kind to your cows. It pays to associate with your cows often. Go into the barn often, curry them, caress them, and see if they want anything. Don't keep them so that when you go into the yard, a cow will stick up her head and light out for the other side of the yard. Management is one of the most important things; in fact, it covers the whole business. I want to say that the dairyman is one of the most peculiar men there is going. Now, in re-

gard to the management of this thing. Winter dairying pays, with me, the best of anything that is done. I am engaged in winter dairying to-day, and have been at it six or eight years. I discovered that something must be done.

The old-time way of dairying is played out, and we must resort to some other way. There are a good many things to consider when you go into winter dairying. First, cows coming in in the fall will give about one-third more milk than those coming in in the spring. The best time to have them go dry is about dog days, when the flies are bad, and the milk almost worthless. Then is the time you want to be engaged in the harvest. I have tried making cheese in the winter, and it has been a failure with me; I can't do it. I have tried it two years. I resorted to dairying, and it is a success, so I shall follow up dairying. The calves we want to raise, we feed the skim milk. I have a separator, and we run the milk through the separator, and then send the milk right back to the cows. I don't care what breed I have, just so I get a butter breed. I don't care anything about long pedigrees. They may be all right for breeders, but I am not a breeder; I am a dairyman. I want the milk, and I want a cow that will produce the milk. Raise your own cows; don't depend on buying cows. If you depend on buying and selling your cows, you are going to be a failure. Raise your own cows, from your very best milking cows. I have found that the cow that has been raised from calf-hood up, is the cow that does best in the dairy; but the cow that has been bought from a neighbor, even if she has been a number one cow when he had her, has been a failure when she came to my barn.

I had a cow I bought two or three years ago from my nearest neighbor, and paid a fabulous price for her, knowing that she was a good one; and, if my judgment was good for anything, she ought to have been a first-class cow. I have seen her milked, and have milked her myself, and she did not give half as much as when he had her. He has come over and had her milked, and milked her himself, and she was a failure. She never would do well with me, and I kept her two years, and sold her to the butcher for one-half of what I gave for her. In feeding cows, the needs of each cow should be studied, and her individual wants supplied. For instance, you have bran and linseed meal, and mix it all alike, and feed the same proportion to each cow. I have cows that I have to give more carbonaceous food than I have to others. One cow that I have is a grade Holstein that I raised because of her ancestry. She is very small, and had a very fine line of ancestors. I said to my son, "I shall raise that calf, if it is a heifer, if it is as big as a woodchuck;" and it was not much bigger. She gives twice her weight every month in milk. That is all she is fit for. I must give her more carbohydrates. It is difficult for her to get up sometimes, on account of the immensity of her udder. There are many other things that I might say, that will possibly be brought out in answer to questions.

S. P. Bates. I have a few words to say on the subject that has been introduced—the feeding of the cow. I have a right to speak to Crawford county dairymen, although I am not known in this community as a dairyman. I was born on a farm, and, until I was twenty years old, I knew no other occupation. Last summer I visited a farm over

here in the Cussewago valley, near the mouth of the stream, and, you know it is a very sluggish stream. I noticed a herd of cows on the bank of the stream, and they presently came down to the stream to drink, and what kind of water do you suppose I saw in that river? The mud in the Tiber was never equal to the mud in that Cussewago stream; and, in all the eddies, there was a green slime, and those cows were not allowed any other drink but that muddy, slimy stream.

On the opposite side of the road, on the hillside, there were springs of clear, pure water which could have been furnished for those cows at very little expense and trouble. It seems to me that farmers make a great mistake in not furnishing their cows with pure, clear water. When I was a boy my father had a pasture of some twenty acres, in which there was no water, and the man who had owned the pasture before him had scooped out a hole in the lower part of the meadow, where the rain-water accumulated, and where, in wet weather, there was water sufficient for the cattle to drink; but, in a dry time, the pasture was useless, because there was no water in it. My father went to the upper portion of the pasture, and dug a well about thirteen feet deep, and came to a very fine stream of water. He laid a pipe to the lower portion of the pasture, and took a big molasses hogshead and sawed it in two, and set it in the ground, and the water would flow out of one into another of those hogsheads, and they were always full of pure, clean water.

THE INFLUENCE OF FOOD UPON THE QUALITIES OF BUTTER-FAT.

Dr. WILLIAM FREAR, *Penn'a State College.*

Popular opinion has always maintained the existence of characteristic properties in butter-fat due to the specific nature of the food consumed. This firm belief has been followed by practice in the compounding of rations for the production of specific qualities in butter, or for the balancing of one food against another in a ration designed for general use in milk production.

With present knowledge concerning the elimination of drugs, sulphur oils, etc., through the milk glands, the proposition that the quality of the milk, and consequently of the butter, as respects flavor and color, is affected by the character of the food, should arouse little question. But with the certainty that the chief source of milk is to be found in the breaking down of the cells of the milk glands, and in the metabolic changes wrought in the tissue of the gland rather than in any simple process of transudation, even of a selective character—the belief that the consistency of the fat, which must in part depend upon the chemical constitution, varies with the nature of the food, makes welcome any experiments more precisely expressing the facts.

It may be remarked, that public opinion is fully as insistent concerning the influence of food upon the consistency of butter, as it is concerning its effect upon flavor and color. Fleischmann (a) has collated the following observations:

"Potatoes, if fed in quantity greater than 33 lbs. per head, make the butter hard.

"Wheat, spelt and barley straw make moderately hard butter; pea and vetch straw somewhat harder; and oat straw, soft butter.

"Both wheat and spelt bran produce soft butter.

"Of the European oil-cakes, linseed gives the hardest, palm-nut cake next, and rape cake the softest butter.

"Distillery slump produces, if fed in excess, a smeary butter."

Warington (b) writes that "rape-cake, oats and wheat bran are reckoned in Denmark as first-class butter feeds, palm-nut cake and barley as second-class, and linseed cake, peas and rye, as third class;" the latter producing the hardest butter. Pott, in his admirable work on cattle foods adds that beet leaves produce a hard, lumpy butter, and rye-bran a coarse, hard kind, while cotton-seed meal not only imparts hardness, but poor keeping quality.

Until very recently, however, no very exact experiments have been made touching this question. One of the earliest was made by Turner (c), who fed a single cow exclusively upon oil meal, and observed a decrease in insoluble fatty acids.

The first, however, to arouse considerable discussion were made by Adolph Mayer (d), of the Wagenigen experiment station. This investigator, querying as to the cause of the low price of Holland butters, as compared with Danish, in the London markets, was informed that it was due to the fact that the former were too soft. The cause of this difference could be traced to nothing but the food. The Holland cattle are maintained largely by pasturage; the Danish cattle, on the other hand, are chiefly stall-fed, and receive large amounts of straw in their rations. To test what difference such variation in food would produce, Mayer fed a single North Holland cow, taken early in her lactation period, with different foods, repeating the ration after an interval, to determine the influence of the advance in the period of lactation. The period elapsing between the beginning of the feeding of a particular food, and the time of drawing the first sample, was usually 12 days, and the sampling was usually repeated two to four days after that. In the butter-fat, the melting and congealing points were determined, together with the relative density and the proportion of volatile fatty acids (by Reichert's method). The average results for the different periods are as follows:

(a) Molkereiwesen. p. 621, seq.

(b) Chemistry of the Farm, p. 105.

(c) Cf. A. Mayer, *Idw. Vers. Stat.*, 35, 372.

(d) *Ib.* p. 261.

RATION.	Date.	Specific gravity.	Melting point C. deg.	Congea-ling point C. deg.	Volatile fatty acid.
a. Meadow hay,* 15 K., linseed cake, 2 K.,	Jan. 2-Feb. 4, . . .	0.8632	37.8	23.5	29.5
	Mar. 19-28,	0.8627	39.7	26.3	27.1
b. Grass silage; linseed cake, 2 K.; little hay first three days, . .	Feb. 4-18,	0.8621	39.9	26.5	26.4
	Mar. 28-Apr. 13. . .	0.8620	38.7	26.3	20.1
c. Field beets, 20 K.; hay, 8 K.; linseed cake, 2 K.; little ensilage at first,	Feb. 18-Mar. 3, . .	0.8627	39.7	26.3	32.4
	Apr. 13-May 2, . .	0.8629	36.7	22.6	28.2
d. Meadow grass <i>ad lib.</i> ,	May 3-June 21. . .	0.8633	33.5	22.9	27.8
e. Clover, containing only 14 per cent. of grasses,	June 22-July 6, . .	0.8631	33.4	23.3	27.4

* Containing 7 grasses and 10 clovers, etc.

Briefly expressed, it was found that variations in volatile fatty acids and in specific gravity went hand in hand; but that, in general, the melting points varied independently of the other variations, and, presumably, from difference in the olein content.

The period of lactation, as it advanced, was marked by a diminution in volatile fatty acids, and usually in specific gravity; but, also, with slight exceptions, by a lowered melting point.

The experiment showed, however, that the specific character of the food often entirely reverses the tendency due to advance in lactation. Beets gave most volatile fatty acids, meadow grass and clover next, with hay not far off, and silage least; while silage and hay gave the least readily melted butter, beets nearly as little, and meadow grass and clover much more readily. The congealing points were less distinctive, though exhibiting variations of a similar tendency.

Without attempting to mention the results of general researches having some slight bearing on the subject, it will be desirable to present some of the evidence upon which Mayer's conclusions have been disputed.

H. B. Cornwall and Shippen Wallace (e), without giving any specific details of their work, state that the examination of the composition of the butter fat, as regards its volatile fatty acid content, obtained from a single cow at different intervals during a whole year, gave no evidence of any variation owing to specific nature of the food.

Prof. L. F. Nilson (f) analyzed the milk fat from 15 Swedish cows for a whole year (1884-85). The food from November 4-December 21, 1884, was barley and rye chop, 3 K., beets, 7 K., and meadow hay, 9 K.; from December 22-February 21, 1885, chop, 2 K., beets, 14 K., and hay, 9 K.; from February 22-June 17, rye, barley and pea chop, 2 K., linseed

(e) Zeitschr. f. Anal. Chem., 26, 317.

(f) Meddelanden Fran. Kongl. Landtbruks-Akad. Experimentalfalt, No. 2, 1887, 45; Centr.-Bl. Agric. Chem., 17, 171.

cake, 1.5 K., and hay, 9 K.; from June 18-October 31, chop, 2 K., and green food. The animals were in different stages of lactation, but on arranging the results, which need not be detailed, in columns corresponding to the months since the beginning of lactation, it is found that the percentage of volatile fatty acids decreases with great regularity with the advancing lactation. The author therefore concludes that the composition of the butter-fat is independent of the nature of the food, and the difference between summer and winter butter is to be explained by the fact that in the former season cows are usually in an early stage in lactation. The editor of the "Centralblatt" aptly remarks, however, that this conclusion is too sweeping, since the quality of butter-fat is conditioned upon other factors, as well as upon the content of volatile fatty acids.

Schrodt and Henzold (g) studied this problem at the Keil station, using a herd of ten cows, and examining their butter product twice a week from April, 1889, to April, 1890. The cows were of the Angle, Breitenburg and Shorthorn-Ditmarsch breeds; they were pastured from May 16-October 3; their winter ration contained meadow hay, oat straw, field beets and cottonseed meal; the change from stall food to pasture was broken by feeding green rye, May 1-14; and the reverse change in the fall by feeding beet-leaves in addition to the usual winter ration. The analyses included determinations of volatile fatty acids, by Wollny's method; insoluble fatty acids, according to Hehner, of the iodine number, to indicate the proportion of olein present; and of the refractive index as shown by an Abbey refractometer. On arranging the results in an order corresponding to the increase in the average number of days since calving, there was found an almost invariable decrease in volatile fatty acids, a corresponding increase in insoluble acids, and a somewhat variable increase in the iodine number with an advance in the time since calving. There was little variation in the refractive index. No departure from this general tendency was observed as occurring at the time of changes from one food to another, although daily observations were made from May 1-16, when green rye was added to the winter ration.

The same is true of results obtained during the same year from daily analyses of the butter of a single Angle cow, similarly fed. In this case the insoluble fatty acids were not determined.

The same investigators extended their observations to a large herd of 220-230 cows, of a cross between the Angle and the Ayrshire breeds (h). The herd was pastured from May 7 to the end of October, 1890, the stall-feeding lasted from that time until May 21, 1891, when pasturing again began. The winter ration was composed of clover hay, meadow hay, oats and barley straw, oat, barley and pea chop, wheat bran, palmtree and peanut cakes, and usually a little wheat straw. The times for calving distributed themselves as follows: October-December, 1889, 66 cows; January-March, 85; and in 1890-91, November-January, 63; February-April, 97; the end of the period of lactation usually occurred from July-October. Analyses were made of butter samples drawn weekly, the determinations being the same as

(g) Ldw. Vers. Stat. 38, 349.

(h) Ldw. Vers. Stat., 40, 299.

before, except that the iodine number was omitted. The volatile fatty acids gradually decreased from May 1890, to October. In November, concurrently with the calving of a large number of the cows, a sudden increase was observed, reaching its maximum in March, when most of the cows had calved, and then again falling off. The variation in insoluble fatty acids is not so regular; in general, however, while from July-October, 1890, the volatile fatty acids equivalent was 23.71 cc., the insoluble acids equalled 88.69 per cent.; while the averages for May, June and November of the same year were 27.28 cc. and 88.16 per cent. While no close correspondence of refractive index and volatile acid was observed, in general the maximum refractive co-efficient was obtained from butter containing the least volatile fatty acids; the same was true, in less marked degree, in the first experiment. As a consequence of these results, the authors strongly oppose the popular belief that food influences the hardness of butter.

Vieth (i) made analyses of butter from a herd belonging to the Aylesbury Dairy Company. The animals were mainly of the Short-horn breed, the rest, about one-fourth, being Kerry-Jersey. The animals were stall-fed, and received hay, brewer's grains, oats, linseed cake, and, to the end of April, sweet silage; also, at times, beets, soiling crops, wheat, barley, linseed, cottonseed and peanut meals. The herd was renewed by fresh cows as fast as those originally present went dry; the author believes that, for this reason, no change due to advance in lactation period could occur, and yet, as in preceding years, there was noted a depression of volatile fatty acids from 26.2 cc. in June, 1889,—23.3 cc. in September,—25.8, in October,—21.3 in December,—26.2 in June 1890, with intermediate results on intervening dates. Similar variations were noted in the following year. The author was not inclined to attribute the variations to the influence of individual foods, but could offer no explanation for them.

P. Spallanzani (k) analyzed 70 samples of butter from various creameries, and is of the opinion that the causes of increase in the volatile fatty acids are to be found in the higher elevation of the places whence the samples were derived, the influence of special breeds, the large size of the milk globules, and richer food; that a decrease is due to advance in lactation, rancidity and excessive washing.

A. J. Swaving (l) made, at the Royal Experiment Station at Breda, Holland, determinations of volatile fatty acids in butter, sent twice a month from each of nine provinces of Holland; a record of the number of cows, times of calving, and of the food, was kept. It will not be possible to present the detailed results upon which the author bases his conclusions, but he feels warranted in concluding that both food and advance in lactation affect the content of butter in volatile fatty acids; that, in general, an increase occurs at the beginning of lactation, with a gradual diminution thereafter; also, that an increase occurs during pasturage, but a decrease when field beet leaves are fed; while hay and linseed cake are similar in effect to late fall pasturage. Schrodtt and Henzold claim that all the variations ob-

(i) *Milch Ztg.*, 19, (1890) 722; (1891) No. 7.

(k) *Milch Ztg.* 1889, Nos. 24-25, from Staz, sper. agr. ital.

(l) *Ldw. Vers. Stat.*, 39, 127.

served by Swaving can be rationally accounted for by the influence of the variation in the stage of lactation. Indeed, concerning results obtained from the combined milks of a whole herd, it must be admitted that the causes influencing the composition of the butter must be active in different degrees at different times, and that the exact moment to be assigned to the influence of each factor at a given time can with difficulty, if at all, be determined.

A. Mayer (m) reports, however, later results confirming those previously obtained by him. The experiments were conducted upon single animals; in the first series, upon a cow of North Holland breed, calved April 7th, and having an excellent appetite. The samples were taken 8-10 days after the feeding of a particular ration began; accepting Kuhn's results (Jour. f. Ldw., (8,77,347) which tend to show that the qualitative influence of a new food reaches its maximum only after 6-11 days. A second sample was taken two days later. In addition to milk yield and composition, record was taken of the melting point, congealing point and amount of volatile fatty acids, according to Wollny's methods, in the several samples. The results obtained were as follows:

NO. OF RATION.	Date.	Character of feed.	Melting point, C. deg.	Congea-ling point, C. deg.	Volatile fatty acids, cc.
I.	Aug. 25-Sept. 6, . . .	Good pasture,	38.5	24.3	24.6
II.	Sept. 7-19,	Poorer pasture,	38.5	24.5	23.5
III.	Sept. 20-Oct. 4, . . .	Hay, 15 K.; linseed cake, 2 K.,	39.1	25.5	23.0
IV.	Oct. 5-17,	Ration III, plus 50 cc. concen- trated lactic acid,	37.5	23.3	23.8
V.	Oct. 18-29,	Ration III, plus 100 cc. of the liquid fatty acids from stearin works,	36.8	23.0	24.4
VI.	Oct. 29-Nov. 9, . . .	Ration III,	37.6	24.7	24.4
VII.	Nov. 10-17,	Hay, 10 K.; linseed cake, 2 K.,	38.0	25.9	24.0
VIII.	Nov. 18-28,	Pea straw, 10 K.; rye straw, 5 K.; sesame cake, 4 K., . . .	40.0	28.3	17.6
IX.	Nov. 29-Dec. 8, . . .	Pea straw, 10 K.; rye straw, 5 K.; linseed cake, 4 K., . . .	39.9	28.8	16.3
X.	Dec. 9-20,	Pea straw, 5 K.; rye straw, 10 K.; peanut cake, 3 K., . . .	38.4	27.6	19.8
XI.	Dec. 21-31,	Pea straw, 15 K.; rye, 4 K., . .	37.2	27.6	24.8
XII.	Jan. 1-12,	Ration III,	37.1	27.6	24.8
XIII.	Jan. 13-22,	Beet chips, 40 K.; rye straw, 5 K.; linseed cake, 4 K., . . .	36.3	25.1	24.5
XIV.	Jan. 23-Feb. 4, . . .	Corn silage, 10 K.; rye straw, 8 K.; linseed cake, 4 K., . .	37.9	22.9	21.2
XV.	Feb. 13-25,	Pea straw, 11 K.; rye straw, 5 K.; poppy cake, 4 K., . . .	43.0	31.4	13.5

(m) Ldw. Vers. Stat. 41, 15.

As the cow thus far used had reached an advanced stage in the lactation period, another animal was taken, of the Angle breed, 7 years old, and having calved February 27th. The following results were obtained:

NO. OF RATION.	Date.	Character of food.	Melting point, C. deg.	Congea-ling point, C. deg.	Volatile fatty acids, cc.
I.	Mar. 9-17,	Grass silage, 40 K.; linseed cake, 2 K.,	44.1	29.3	21.2
II.	Mar. 18-31,	Hay, 13 K.; linseed cake, 2 K.,	43.9	30.5	25.8
III.	April 1-12,	Rye straw, 9 K.; pea straw, 4 K.; cotton-seed cake, 3 K.,	44.2	32.6	23.9
IV.	April 13-24,	Ration II,	43.5	31.0	27.2
V.	May 2-12,	Hay, 9 K.; germ feed, 4 K.,	38.3	26.4	29.5
VI.	May 13-24,	Pasture, heavily manured with sodium nitrate,	38.8	26.8	29.6
VII.	May 25-June 8,	Pasture manured with phosphates and potash salts,	38.6	27.2	32.2
VIII.	June 9-19,	Ration VI,	39.0	26.9	30.1
IX.	June 20-July 3,	Ration VII,	39.5	27.0	28.8

The results with the two cows are not directly comparable, since the individuality of the animal undoubtedly introduces a variation. The range of volatile fatty acids in case of the first animal was from 13.4-24.9 c.c.; and of the second, 20.1-32.2 c.c. The range of variation is in each case so important, and in each case so far from showing any direct relation to the advance in lactation, that there seemed to be no other alternative but to attribute such departures from regularity as occurred with cow No. 1, between periods VII and XI, to the specific influence of the food. The influence of advancing lactation was less apparent with cow No. 1 than with No. 2, probably, as Mayer points out, because the former was in a later stage of lactation, when the change is not rapid.

Arranging the foods in the order of the content of the butter product in volatile fatty acids, beginning with the highest figures, we have for the foods used, the following classification:

	Coarse foods.	Concentrated foods.
Class I,	Beet chips, Spring pasture,	Rye. Corn germ feed. Cotton-seed meal.
Class II,	Green clover,	Peanut cake. Sesame cake. Linseed cake.
Class III,	Fall pasture, Hay. Silage, corn and grass, Straw.	Poppy-seed cake.

The addition of lactic acid and of the liquid acids from the stearin factory, produced no marked result.

Classifying the foods in accordance with their apparent influence upon the melting point, beginning with those producing the hardest butter, the order is as follows:

	Coarse Foods.	Concentrated Foods.
Class I,	Straw,	Poppy-seed cake.
Class II,	Hay and silage of corn and grass, Old pasture, Beet chips, Young grass,	Linseed cake, sesame cake. Peanut cake. Rye and cotton-seed meal. Germ feed.

In general, the conclusion is drawn that butter fats rich in volatile acids and high in specific gravity, are also of comparatively low melting point.

Upon the results of Schrodtt and Henzold, Mayer remarks that their winter ration was compounded of foods of opposite tendencies, which happened in this mixture to be so balanced as to give a result similar to that of the pasture; that, therefore, there was no good ground in their results for any conclusion as to the influence of food, beyond the bare statement of that fact.

It may fairly be objected that before Mayer's conclusions as to specific food combinations are accepted, we should know something more concerning the normal variations from time to time of a single cow upon a single ration. On the other hand, Mayer claims that with longer periods, a fuller specific effect might be obtained.

American Experiments.

It may, however, be remarked, that some of the best work upon this subject has been done by several American experiment stations.

E. F. Ladd (n) made one of the earliest experiments in America

(n) *Agric. Science*, 2, 251; *N. Y. Agr. Exp. Station Report*, 7, 284.

touching this question. His experiments were made in two series; the first, with two Jersey cows, both approaching the end of their periods of lactation; the second, with two native cows, fresh in milk. The periods were about 13 days in length, and the tests were made near the ends of the periods. The hay fed in the first series was orchard grass; that of the second series, timothy, with some clover. The first period hay (20 lbs.) was fed alone; this period was omitted in the second series; the second period the ration was: hay, 17 lbs., corn meal, 8 lbs.; the third period, hay, 20 lbs.; corn meal, 2 lbs.; linseed meal, 5 lbs.; and the fourth, hay, 18 lbs.; corn meal, 2 lbs., and wheat bran, 8 lbs. There was some departure from these figures in the case of the hay, and, in the second series, on the part of one animal, which refused to eat a full allowance of either linseed meal or bran. The results of the examinations of the butter-fats are as follows:

PERIOD.	Volatile fatty acids cc.	Iodine number.	Saponification equivalent.	Melting point C.O	Viscosity of soda soap.
Series I.					
1.	11.3	31.11	230.2	32.4	78
2.	12.0	31.79	227.3	33.3	63
3.	12.1	34.58	222.0	34.9	102
4.	12.4	29.70	221.5	35.5	74
Series II.					
2.	12.7	43.80	233.6	32.4	151
3.	11.5	46.90	228.0	30.3	286
4.	12.3	34.70	—	32.6	124

There is little noteworthy in the figures for volatile fatty acids, and for melting points, but a marked increase in the iodine number, and in the viscosity, with a diminution of the saponification equivalent, in both cases attended the change to the linseed meal ration.

In 1889, Prof. H. H. Harrington (o), of the Texas Station, called attention to some remarkable results from the examination of butter produced when feeding large quantities of cottonseed meal, with a little pasture. Only two cows' butter was examined. The results obtained were: with cottonseed meal, volatile fatty acids, 10.9 c.c., M. P. melting point 45.3 degrees; without cottonseed meal, volatile fatty acids, 12.6 c.c., M. P. 34 degrees.

These results were confirmed by Dr. H. W. Wiley (p), chief chemist of the United States Department of Agriculture, who examined portions of the same butter, and who further noted the persistence in the butter of the reducing agent which is peculiar to cottonseed, and which behaves toward silver like aldehyde.

This observation led both these investigators to experiment further. Dr. Wiley (q) experimented further upon samples secured for him by

(o) Agric. Science, 3, 79.

(p) *Ib.*, 3, 81.

(q) Proc. Soc. Prom. Agric. Science, 1889, 84.

Prof. Harrington, representing the butter from several single cows fed upon various foods, with and without cottonseed. The individuality of the animals introduced variations which unfitted the results for comparison. Arrangements were then made with the Maryland Station for the prosecution of experiments in which this source of variation should be avoided. A Jersey, Ayrshire and Jersey-Ayrshire were first pastured for 10 days, and butter taken the last three days; they were then gradually given as much cottonseed meal as they would eat, being kept meanwhile on very short pasture; this feeding began July 25th; by August 1st the animals were eating about 10 pounds per day. The butter of August 2-4 was taken for examination. The results obtained were:

	PASTURE.			COTTON-SEED MEAL.		
	Jersey.	Ayrshire.	Jersey-Ayrshire.	Jersey.	Ayrshire.	Jersey-Ayrshire.
Melting point, C°	34.9	36.3	35.2	38.4	49.0	38.3
Iodine absorbed, per cent.	37.7	41.1	38.0	34.9	36.8	35.2
Volatile fatty acids,	22.8	22.5	22.1	21.4	20.8	21.1
Specific gravity, . . . . .	.9010	.9005	.9019	.9016	.9012	.9011
<i>Fatty Acids Alone.</i>						
Crystallizing point, C°	38.95	39.80	38.55	41.25	43.50	41.45
Iodine absorbed, per cent.,	38.69	42.50	39.20	37.96	38.72	37.63

In each case, the cottonseed butter showed the presence of the peculiar reducing agent. The increase in melting point, decrease in iodine absorptive power, and slight decrease in volatile fatty acids were observed also without exception.

Prof. Harrington's (r) experiments were made upon a herd of cows divided equally, and at the same time, upon two single cows, a Durham grade and a Jersey grade. To the first half of the herd was fed:

I. Corn and oatmeal, hay as wanted, ensilage, not more than 20 pounds per day.

II. Cottonseed meal and hulls only.

V. Equal parts corn and cob meal, oats and bran; silage and hay when wanted.

To the second half of the herd and the Jersey grade:

III. Equal parts corn and cob meal and oats, crab-grass and pea vine hay; silage, not more than 20 pounds a day to the herd.

IV. Cottonseed only, cooked or raw.

V. As with the first section of the herd.

Nothing is said of the length of the several feeding periods prior to the collection of samples; the tests were repeated in each case, several days after the drawing of the first samples.

The average results were:

(r) Texas Agric. Exp. Station Report, 1889, 100.

ANIMAL.	Rations.	Date.	Melting point, C.°	Volatile fatty acid, cc.
Durham Grade,	I.	Dec. 20-23, '89,	36.0	15.5
	III.	Jan. 8-17, '90,	40.4	10.8
	V.	Feb. 5-6, '90,	37.7	15.5
Jersey Grade,	II.	Dec. 20-23, '89,	36.4	14.3
	IV.	Jan. 7, '90,	34.0	*7.0
	V.	Feb. 5-6, '90,	35.0	16.8
Station herd, first half,	I.	Dec. 20-23, '89,	35.7	15.2
Station herd, first half,	III.	Jan. 7-17, '90,	41.3	9.5
Station herd, first half,	V.	Feb. 5-6, '90,	34.9	14.5
Station herd, second half,	II.	Dec. 20-23, '89,	35.3	14.6
Station herd, second half,	IV.	Jan. 7, '90,	40.5	7.9
Station herd, second half,	V.	Feb. 5-6, '90,	35.4	14.6

* Butter affected by process of manufacture and by loss of one sample.

Prof. George W. Curtis(s) continued the work, extending the observations to market quality as judged by a number of trade experts, acting independently of each other. The scale of points was flavor, 45; grain or texture 30; firmness or body, 25; total, 100. Unfortunately, the statement of results is such as to leave the succession of feeds and the identity of the animals receiving the several rations in doubt. As to feeding, while the animals ate according to appetite, the proportions of ingredients of stable feed were carefully kept unchanged; when ensilage was fed, 15-17 pounds per day, and when hay, five pounds per day was allowed. Feeding was continued, in each case, for 12 days before samples were drawn. The following results as to melting point and volatile acids were obtained:

RATION.	Melting point, C.°	Volatile acid, cc.
1. Corn and cob meal, whole oats and bran, equal parts, with mixed hay of sorghum, and pea-vine, and ensilage, with winter pasture,	34.1	15.4
2. Cotton-seed-meal and hulls alone, without pasture,	40.8	10.1
3. Cotton-seed only, cooked or raw, without pasture,	40.4	7.9
4. Cotton-seed-meal, one part; whole oats, three parts; sorghum, hay and scant fall pasture,	37.3	13.1
5. Cotton-seed-meal and whole oats, equal parts; pasture as in No. 4,	36.6	13.4

No allowance can be made for influence of advance in lactation, or of individuality of cows, but the results vary, as would be anticipated, were cottonseed the chiefly influential factor.

The results of expert tests as to market quality are as follows:

(s) Texas Agr. Exp. Station, Bulletin II.

RATION.	Flavor.	Grain.	Body.	Total.
6. Oats, bran, corn-meal, corn and cob-meal, ensilage, sorghum, pea-vine and millet hay, with variation of nutritive ratio between 1.4 and 1.6,	39.25	25.02	22.24	86.51
7. Corn-meal, 6 lbs.; cotton-seed-meal, 4 lbs.; bran, 5 lbs.; millet and pea-vine hay, 5 lbs.; free access to fresh pasture; nutritive ratio, exclusive of pasture, 1.4,	38.12	25.44	22.23	85.79
8. Like 2, except corn-meal, 5 lbs., and instead of cotton-seed-meal, bean meal, 2 lbs., and linseed meal, 3 lbs., nutritive ratio, 1.4,	39.10	25.91	22.09	87.10
9. Oats, 11 lbs.; cotton-seed-meal, 4 lbs.; scant, poor pasture,	38.59	21.67	20.54	75.80
10. Oats, 11 lbs.; cotton-seed-meal, chiefly cooked, 11 lbs.; pasture as in 9,	34.48	21.87	20.61	76.96
11. Cotton-seed-meal only, raw and cooked,	30.90	18.50	21.25	70.68

That is, with scant pasture or fed alone, cottonseed meal not only injures the flavor, but makes butter too hard; but with free access to good pasture, the influence of the latter balances that of the cottonseed meal. It was further observed that cottonseed butter was deficient in natural color; also, that cottonseed cream required to be churned at a higher temperature: if sour, 4-8 degrees F.; if sweet, 1-3 degrees F. Without attempting to follow further the question of "churnability," it is of interest to note the conclusions of Sturtevant (t), Alvord (v), Armsby (w) and Woll (x), that grass and silage in food, increased the completeness of churning under ordinary conditions.

Experiments upon the same subject were made by Dr. N. T. Lupton (y) at the Alabama Experiment Station. The animals used were a herd of registered Jerseys, and a single Jersey cow. The rations were:

I. Ground oats, corn meal and bran, each 5 pounds; nutritive ratio, 1:5.8.

II. Bran, 5 pounds; ground oats, 4 pounds; cottonseed meal, 3 pounds; silage, 11 pounds; nutritive ratio, 1:3.75.

III. Cottonseed meal, 4 pounds; cottonseed hulls, 9 pounds; silage, 4 1-2 pounds; nutritive ratio, 1:5.08.

IV. Raw cottonseed meal and cottonseed hulls alone, ad libitum.

V. The same, using cooked meal.

No statement is made concerning the use of hay or pasture during the feeding. After a preliminary feeding of 10 days, the feeding periods were begun, and lasted seven days each. Samples were taken on alternate days. The butter fats showed the following properties:

(t) New York Agr. Exp. Station, 2d Report, 1883, 95-116.

(v) Proc. Soc. Prom. Agr. Sci., 1883-4, 23-4.

(w) Pa. State College Agr. Exp. Station, Report 1888, 60.

(x) Wisconsin Agr. Exp. Station, 5th Report, 52.

(y) Ala. Agr. Exp. Station, Bulletin 25.

RATIONS.	HERD.			SINGLE COW.		
	Sp. gr. at 100° C.	Melting point, C°.	Volatile fatty acid.	Sp. gr. at 100° C.	Melting point, C°.	Volatile fatty acid.
I,	0.9028	35.6	29.8	0.9032	34.2	31.4
II,	0.9028	36.1	30.5	0.9015	36.3	31.1
III,	0.9019	37.4	27.5	0.9000	39.4	25.4
IV,	0.8990	43.6	22.1	0.8985	42.5	20.4
V,	0.9026	42.7	22.5	0.8986	43.5	21.9

No difference in the color of the fat was noted.

At the Pennsylvania Station also, careful experiments were made upon the influence of cottonseed meal, and reported by Prof. T. F. Hunt (z). There were 12 cows used in this test, and they were divided into two lots, about equal as respects advance in lactation. During period I (April 13-May 10), lot I received corn meal, 4 pounds; bran 6 pounds, daily, with roughage in the form of hay, stover, silage and green rye. Lot II had a grain ration of the same weight in which cottonseed meal, beginning with 2 pounds and increasing to 6, gradually replaced the bran; the roughage was the same. In period II (May 11-June 7), the ration of lot I was little changed, save that silage was omitted and the rye increased in quantity; lot II received 6 pounds of cottonseed meal instead of bran. In period III (June 15-28), both lots received the same ration of corn meal, bran, hay and green timothy and clover. It was found that the "churnability" did not greatly differ in the case of these two lots, at least so far as completeness of separation was concerned; the cottonseed milk seemed to cream by gravity more completely than that of lot I. In general, four market experts graded the butter of lot I at 91 points in a hundred, but the butter of lot II at only 72.5 points. The deficiency was chiefly in body and flavor. The melting point of the butter from lot I was, as an average from 8 samples, 33 degrees .9C; that from lot II, 37 degrees .2C.

A very interesting study of the influence of corn meal vs. gluten meal, its by-product in the starch manufacture, and of hay vs. ensilage, was made by Wood and Parsons (a). A further test as to the influence of feeding skim milk was reported at the same time. The rations fed were:

I. Ensilage, 44 pounds; hay, 6 pounds; middlings, 5 pounds; gluten meal, 6 pounds; nutritive ratio, 1:5.2.

II. Like I, except that corn meal, 6 pounds, was substituted for gluten meal; nutritive ratio, 1:9.

III. Like I, except that corn meal, one pound, was substituted for a like quantity of gluten meal; nutritive ratio, 1:5.6.

IV. Like III, save that 5 pounds of corn meal was substituted for like amount of gluten meal; nutritive ratio, 1:8.

V. Hay 22 pounds; corn meal, middlings and gluten meal, each 3 pounds, 5 ounces; nutritive ratio, 1:7.2.

(z) Pa. State College Agr. Exp. Station, Bulletin 17.

(a) New Hampshire Agr. Exp. Station, Bulletin 13.

VI. Like V, except hay, 6 pounds, and silage 44 pounds.

VII. Hay, 25 pounds; corn meal, 5 pounds; middlings, 3 pounds; gluten meal, one pound; nutritive ratio, 1:8.

VIII. Like VII, except hay, 6 pounds; silage, 44 pounds; nutritive ratio, 1:8.

IX. Silage, 44 pounds; hay, 6 pounds; corn meal, one pound; middlings, 3 pounds; gluten meal, 5 pounds; nutritive ratio, 1:5.6.

X. Like IX, except cottonseed meal, 5 pounds, instead of gluten meal, 5 pounds; nutritive ratio, 1:5.6.

XI. Silage, 36 pounds; hay, 4 1-2 pounds; corn meal, middlings and gluten meal, each 2 1-2 pounds; nutritive ratio, 1:7.2.

XII. Like XI, except skim milk, 21 pounds, instead of gluten meal; nutritive ratio, 1:7.2.

These pairs of rations were fed alternately to different pairs of animals in such manner as to eliminate, in the gluten vs. corn meal test, the influence of individuality, and in all cases that of the advance in lactation. The periods of feeding were two weeks in length, and the samples were drawn at the last of each period. In addition to usual tests, a direct mechanical test of hardness of the butters, made as uniformly as possible, was tried. The results were:

VARIABLE CONSTITUENT PRESENT.		Hardness (Mm. of penetra- tion.)	Melting point (C. deg.	Volatile fatty acids.	Iodine absorp- tion.
I.	Gluten,	9.67	33.9	29.6	.....
II.	Corn meal,	5.57	34.0	30.2	.....
III.	Much gluten, little corn,	7.42	33.8	30.5	.....
IV.	Little gluten, much corn,	6.37	33.3	31.0	.....
V.	Hay, equal concentrated foods,	7.9	33.9 (?)	34.2	.....
VI.	Silage, equal concentrated foods,	8.7	31.5	36.4	.....
VII.	Hay, more corn meal,	8.0	34.6	29.9	32.4
VIII.	Silage, more corn meal,	9.5	33.1	32.8	32.7
IX.	Gluten meal,	11.4	34.7	31.0	37.4
X.	Cotton-seed meal,	5.5	38.1	28.8	31.7
XI.	Gluten meal,	9.6	35.1	30.6	36.6
XII.	Skim-milk,	6.5	33.0	31.8	29.0

Later experiments, excellently devised, were carried on at the same station, and reported by F. W. Morse (b). There were several series, devised to study the influence of variation in the various classes of foods. The first series included rations varying in concentrated hay. The feeding periods were about as in the preceding experiment, as also the sampling. The influences of breed and individuality were largely eliminated; not, however, that of advance in lactation. The following tables, re-arranged from the original, will, however, largely assist in determining the latter influence, it being remembered that its general effect is to decrease volatile fatty acids and to increase the iodine number. Instead of expressing the results absolutely, the

(b) New Hampshire Agr. Exp. Station, Bulletin 16.

variations from those obtained with the basal ration will be given. The basal ration A was: silage, 40 pounds; hay, 5.5 pounds; middlings, 2-2 1-2 pounds; corn meal, cottonseed meal and gluten meal, 2 pounds each. (a)*

RATION PER 1,000 POUNDS. LIVE WEIGHT.	Average number of days after leaving Ration A.	Average volatile fatty acids.	Average iodine number.
B. Like A, but substituting 7 lbs. cotton-seed meal for last three ingredients (e).*	19	-5.36	-4.68
C. Like A, but substituting 6 lbs. corn meal for last three ingredients (b).*	24	-2.2	-5.9
D. Like A, but substituting 5 lbs. gluten meal for last three ingredients (c).	29	-2.7	+2.9
E. Like C, but substituting grass 13½ lbs. for hay (g).	38	-3.8	-2.7
F. Like E, but substituting wheat gluten, 1 lb., for 1 lb. of the corn meal (h).	44	-2.1	-3.0
G. Like A, but substituting free pasturage for hay and silage (j).*	59	-3.9	+2.1

* Original designations for rations.

In general, cottonseed meal depressed both factors; corn meal only the iodine number; but gluten meal increased the latter factor; the substitution of grass for hay caused little change, and the same is true of pasturage—except such change as may be due to advance in lactation. The substitution of a little wheat gluten for grass, led to an increase in volatile fatty acids, and a decrease in the iodine number.

In the second series the basal ration A was: silage 50 pounds; middlings, 2 1-2 pounds, and gluten meal and cottonseed meal, each 1 1-4 pounds per 1,000 pounds live weight; with mixed hay and oat hay, each 5 pounds. The feeding conditions were similar to those maintained in the previous experiment. The results, similarly expressed, were:

RATIONS.	Average number of days after leaving Ration A.	Average volatile fatty acids.	Average iodine number.
B. Vetch hay, 10 lbs., instead of the mixed and oats hays (3).*	13	+0.3	+1.9
C. Oat hay, 10 lbs., instead of the mixed and oats hays (5).*	13	-0.4	+0.2
D. Clover hay instead of the mixed and oats hays (2)*	27	+0.9	+1.9
E. Mixed hay instead of the mixed and oats hays (4)*.	27	+1.9	+0.2
F. Silage, only 40 lbs.; mixed hay, 8 lbs., instead of mixed and oats hays, cornmeal, 2½ lbs (6).*	34	+0.9	+2.4
G. Like E, except corn meal, 3½ lbs. added, and middlings reduced to 1½ lbs. (7)*.	34	-0.6	+1.7

* Original numbers.

Vetches and clover seemed to increase both the volatile fatty acids and the iodine number; the effect of clover upon volatile fatty acids is predominant in mixed hay, but not upon the iodine number, which is relatively diminished both by oats and by mixed hay.

These interesting studies were varied in another way, to determine the influence of the several nutrient groups upon the butter fats. The basal ration of the first series was varied by the substitution of raw cottonseed for extracted cottonseed meal; by the substitution of gluten meal and cottonseed oil, and of gluten meal and starch, for corn and cottonseed meal.

These experiments were made at the same time with those of the first series already mentioned, and in the same manner, but with a smaller number of animals. The results may be summarized as follows:

RATIONS.	Animals.	Average advance from 1st date.	Changes in Vol. fatty acids.	Iodine number.
B. (first series) cotton-seed meal.	3	18 days.	24.2	33.8
H. Raw cotton-seed (d*).	3	21 days.	20.1	30.5
D. (first series) gluten meal.	3	38 days.	24.8	39.8
I. Gluten meal and cotton-seed oil (f*).	1	44 days.	19.7	37.8
D. (first series) gluten meal.	3	38 days.	26.6	43.5
J. Gluten meal and starch (f*).	1	44 days.	26.8	36.8

* Original designation of rations.

The cottonseed oil, therefore, decreased the volatile fatty acids markedly, the iodine number slightly, the starch, like corn meal, slightly affected the volatile fatty acids, but very markedly decreased the iodine number.

A second series of experiments upon the influence of various vegetable and animal fats was made, using a basal ration of silage, clover and vetch hay, with oat meal and middlings. In each case 11 ounces of the fat was fed per day and per 1,000 pounds live weight. Single animals were used. The method was otherwise as before. The results are expressed in brief, as follows:

OIL USED.	PREPARATION OF OIL.		CHANGE IN BUTTER-FAT.	
	Vol. fatty acids.	Iodine number.	Vol. fatty acids.	Iodine number.
Cocon-nut.	6.5	7.1	- 0.9	-7.4
Corn.	3.2	112.8	- 0.6	+9.7
Cotton-seed.	1.1	106.1	- 6.1	+8.4
Palm.	1.7	52.2	-1.6	+1.8
Olive.	2.0	47.5	+3.1	-0.7
Stearin.	1.4	24.1	-3.5	+0.8

Fats, except olein, decreased volatile fatty acids; and with the same exception, caused butter to vary with their own iodine numbers.

As a whole, these experiments indicated, with regard to corn meal: 1, that the albumenoids increased the volatile fatty acids, the starch depressed and the oil raised the iodine number. Corn meal, in general, shows the predominant effect of starch. In regard to cottonseed: both the nitrogenous part (meal) and the oil, decreased the volatile fatty acids, but the oil raised the iodine number and the meal lowered it. In general, the cottonseed showed the predominant influence of its nitrogenous constituents.

Further, the fats of foods seemed, in some way not indicated, to very directly influence the fats of the milk.

One other experiment by H. H. Dean (c), may be reported here. It was made to compare the following rations:

I. Silage, 50 pounds; hay (uncut), 5 pounds, and bran, one pound.

II. Silage, 50 pounds; hay (uncut), 5 pounds; pea meal, 5 pounds: oat meal, 3 pounds, and barley meal, 2 pounds.

These rations were fed to two lots of cows, three in each lot; the lots receiving the different rations for four weeks, and then reversing for a similar period. In this way, it was believed, the influence of individuality and of advance in lactation period might be largely eliminated. The average results, as regards quality of butter fats, were:

	Melting point, C. deg.	Iodine number.
1. Silage and hay.	32.79	32.66
2. Silage, hay and meals,	31.38	29.42

The addition of these meals caused little change in melting point, but considerably depressed the iodine number. An experiment, made by the same investigator at an earlier time, indicated that silage produced a butter of low melting point; this was increased by an addition of a mixture of oil meals and hay to the ration; and especially if cottonseed meal was added.

Experiments above recorded indicate very clearly that not only does the chemical constitution of butter fat vary with the advance in lactation, but also with the character of the food. They do not, however, suffice either for the framing of a theory as to the relation of the several food constituents to the fats of the milk, or for the quantitative measure of the influence of a given food. We lack knowledge as to the limits of error due to periodic variation in composition of butter fats from single animals fed on an unvarying ration; and also, as to the time required for the attainment of the maximum variation due to food. In most cases, the study of too many foods has been attempted in a short time, to permit the certainty of attainment of such maximum effect. Nor is there certainty as to the exact relation which specific gravity, melting points, iodine number, etc., bear to market quality; note, for example, the interesting differences in the

variation of hardness of butter determined mechanically, and in that of the melting points of the butter fats, shown in the New Hampshire experiments. Nor do these results throw any light upon the exact nature of the changes in composition of the fats that are the causes of the variations in the chemical and physical properties observed. Is it, for example, to be taken for granted that an increased iodine number means an increased percentage of olein, and not, possibly, as Wiley suggests, a transfer unchanged of members of the linoleic series?

The results, when compared, show discrepancies, but this is to be expected under the conditions of experiment, and when we recall the variables just mentioned, whose influence has not been eliminated, and the other variations due to differences in laboratory methods employed. Without recapitulation of individual results, it may fairly be claimed that these laboratory researches have, in general, fully justified the practice of classification of foods as to their influence upon the quality of butter fats, irrespective of their food influence in other particulars, and that with the general tendencies thus established, more exact studies of the influence of individual foods are warranted by its importance in practice. Furthermore, that more extended studies of the influence of the single nutrients upon the composition of the fat secreted by the milk gland, as bearing upon the chemical physiology of lactation, are fully warranted.

A resolution was presented by G. D. Heath, recommending W. H. Hatch, of Missouri, for Secretary of Agriculture, under the new administration.

A. L. Wales. Although I do not fully agree with Mr. Hatch in politics, I recognize his ability and fitness for this position; therefore, I move that this Association adopt this resolution as read.

John S. Kean. I second the motion.

The resolution was adopted as read.

Mr. Critchfield. The committee appointed to examine the samples of butter submitted by the lady from Hayfield, desire to make some inquiries of the lady before making a report; but I understand that Mr. Gurler is ready to report.

Prof. Gurler. Mr. President: I was not the chairman of the committee. We find the sample of butter made in June well preserved, and good butter for June butter; in fact, it was the better butter of the two. It had a better flavor than the butter that was made a few days ago. I hardly knew what to think of the sample that was marked "made on the 31st of January." I have a little suspicion that it was not fresh-made butter, or the cream had been contaminated in some way. It is away off flavor. It is older than it ought to be when it is two months old. In my opinion, the butter was ruined by the cream being exposed to some bad odors, which it absorbed. The June butter would sell for from eight to ten cents a pound off from Elgin butter.

Prof. Roberts. In regard to Phelps' address. The gentleman does not agree with me about salting hay in the mow. I suppose he would

not agree with me that the cows' mess should be salted. I would like to ask the gentleman if he should like to have his wife salt the potatoes and beef, or if he would prefer to have two or three quarts of salt set on the table, and lick the salt when he was through. The next question I would like to ask is, how it comes that the speaker says he cares nothing for pedigree, and, in about five sentences afterwards, he says he raised a certain calf because of the very fine qualities of its ancestors?

Mr. Phelps. If I were a cow, I would want my salt in two-quart doses. I would rather have my salt by my plate, and put it in myself.

Prof. Roberts. The butter the same way?

Mr. Phelps. Well, I don't know. Anyway, I want a little salt cellar, or something of that sort, at my plate. Now, as to the pedigree. What I understand by a pedigree is a long string of names. I don't care for that, if the cow comes from a long line of milking stock. I want the cow to demonstrate her ability by her performance.

J. C. Sibley. If you don't observe the pedigree, how will you know what you are getting? What makes it so nice in getting pedigreed stock is, that you can go to the herd-book and trace the ancestry of the animal, and know just what you are getting. It is important to the farmer that pedigrees of valuable stock be recorded, so that when a man is going to put a sire at the head of his herd, he will know whether he is getting a pure bred animal. We must preserve the pedigree.

Mr. Phelps. I said to raise your own calves. Mr. Sibley is selling stock. If you buy, buy pedigreed stock. If you raise your own calves for years and years, raise them from the best-milking cows. If you are going to buy cows, pay for pedigreed stock, and then you will get fleeced many times, to my certain knowledge.

Prof. Gurler. I know a gentleman who has not kept his animals registered, and he now sees the mistake of not keeping his animals registered. He raises excellent stock, and, if they were registered, he could put his own price on them.

Mr. Monrad. I was over in New Zealand, and a lady wanted to sell out a little herd of Alderneys. I said, "I don't care a snap about your pedigrees, but tell me what butter they made last spring." I think that pedigree is necessary, especially to breeders, but I want them to keep a record, not only of the ancestors, but of the performance. We want a record of what a cow is actually doing.

Prof. Gurler. Sometimes in my dairy I have more skim milk than I have calves and pigs to feed it to.

Mr. Phelps. I cannot tell you the value of skim milk to my cows. I feed skim milk to the calves I want to raise, and then some to the pigs, and the balance goes to my cows. I cannot tell whether I get as much out of it when fed to the cows, as to the calves and pigs. Skim milk alone is a mighty poor food for hogs. It is good policy for a man to buy corn at a high price, and feed it with the skim milk. In regard to feeding skim milk to cows, it is my opinion that you are turning it into the mouth and milking it out at the udder. It is an astonishing fact that I have fed to one cow 125 pounds of skim milk. It was skim milk raised by Cooley creamery. That cow increased her milk a little, but she gained in flesh. I don't know the quality of the milk

I got from that cow; I mixed it with the rest. What I wanted to know was, whether I was going to milk that milk back again. It increased the milk some, and I think it is a valuable food for that reason. Butter is worth 25 cents a ton as a fertilizer; if I feed it to the cows again, all I lose is what the cow absorbs in butter.

D. H. LeFever. In Crawford county there are about thirty jelly factories, and the pomace from these factories is thrown away, generally; in some places they sell it for \$1.00 a load. Is there any food value in it? Would it pay for a dairyman to take it away?

Prof. Gurler. In regard to the fertilizer value of it, there is very little good in it for the weight you have to handle. So far as the food value is concerned, it depends on what you feed; whether you feed good, fresh pomace, or not. It ferments very easily when exposed to the air, and it is undesirable to have fermentation take place before it gets to the cow. You may hurt your cow, or, if you don't, you may hurt the milk. It can be used profitably in the silo.

Mr. Phelps. I would like to ask Mr. Gurler if he knows anything about the value of skim milk as a food for cows.

Prof. Gurler. No; I don't. I have an idea as to what it is worth for calves and pigs.

Mr. Critchfield. I have had a little experience in feeding pomace to cows. We used a Boomer & Boschert press, and last fall a year ago, I made up 1,000 bushels of apples, and concluded I would try the pomace on the cows. I was under the impression that it would dry them up, but I thought I would give it a trial. I weighed the milk all around, carefully, the evening before and the next evening, and I discovered that I had an increase in the yield of milk, and I discovered that it was a mistake that cows would fall away in their milk on that kind of food. You take it from the press right home with you in your wagon, and get it to the cows in that condition, and you will find that it won't do them any harm.

R. L. Stebbins. A year ago last fall I fed all the pomace to my cattle. I thought it seemed to benefit them; but I thought that feeding the pomace in the fall, just before winter, was, perhaps, not a good thing for my cattle, as I did not have it through the winter.

Adjourned.

FRIDAY, FEBRUARY 3.

The session was opened at 10 o'clock, with music by Miss Juvia Martin, who sang "The Knights of the Mystic Star."

George M. Orris was the first on the program, and read the following paper on "Farmers' Foods for Dairy Cows."

FARMERS' FOODS FOR DAIRY COWS.

By GEO. M. ORRIS.

The time, it seems to me, has come when the dairyman must raise all of his own feed for his cows, and not depend on the refuse of the flour and oil mills. With myself, I know that I cannot make any profit from another's labor, and so many dollars spent for feed are so many dollars gone from a shadow of a chance for a profit. To be sure, the chemist will tell you this food or that food is worth so many dollars per ton for food for the cow, and worth so many dollars for fertilizer after the cow is done with it. My experience is, the cow's report and the chemist's do not agree. I have fed bran for years, and have come to the conclusion that I have lost money by it. Bran will not make enough milk to pay for itself, nor will it make any butter fat. We have often fed it, expecting we were going to have a gain in the flow of milk, or an increase in butter; but as often have I been disappointed, but kept on feeding because the chemist said bran was worth something like \$20 for feed, and somewhere near \$13 for fertilizer. But we will dispense with bran until we can see a way to realize a profit. We will admit that bran is a good thing to feed with cornmeal, on account of the mechanical action in keeping the cornmeal from forming into a compact mass. There might have been a time that one could make a profit on bran when it was ground on the old-fashioned mills, and not ground so close, and could be bought for less than now. In an article in the "Rural New Yorker," recently, a gentleman stated that he was the owner of a mill, and, at times, he would have a surplus of bran which he would feed heavily to his cows, but never had seen any gain in milk, or any increase in butter. Some will say that you never want to feed bran alone; that, to get good results, you want to always feed with something else. It is the something else that gives the result, and what is the use of feeding the bran?

Wheat middlings will make milk, but, at present prices, not with a profit. Then comes oil meal. We think it has been praised too high. Of course, we will not cry down oil meal, for we think it is a splendid food for cows or young stock; but the price one has to pay for it knocks all the profit off. The price of oil meal has advanced, and the price of the dairy product has declined. The first new process oil meal we fed we bought for \$12 per ton. Before another season the chemist says new process oil meal is worth \$28 per ton for food and \$20 for manure after it has passed the cow. The manufacturer hears of it, and away goes the price to more than double, making a greater profit for the manufacturer.

And so it is the fact, that we have to pay more for food for the cows than we can get out; and, if we want to dairy successfully, we must raise our own feed. That will fill the bill and also the cow, for cows will thrive and pay their owner a profit on clover hay, ensilage, cut cornfodder, millet, corn and oat chop and mangled wurtzels. Clover hay we would place at the head of the list. It has always given the best of satisfaction for butter or milk, provided it was properly cured.

We formerly thought that clover took too much work to cure; but, since we have followed the plan of cutting it off, raking it into winrows in the evening, and hauling next day, we have had it nicely cured. We prefer not to use the horse fork in unloading, as we have lost by it, as it is packed too soon. Put it into the mow by hand, and not trample it. Let settle of its own weight and it comes out in splendid condition. Of course, it should be run through the feed cutter. While it may be too bulky to feed entirely, it will give more return for its cost than any food I know of.

Silage, with us, has proven a decided success. We never had better silage than we had this year. We commenced two years ago by cutting, and let wilt a few days before putting into the silo. This year we cut the corn three or four days before we expected to put it in the silo, but breaks on the feed cutter detained us so we were compelled to wait two weeks. The result was, we had very fine silage, with a sweetish, acid flavor; but not one-third the acid compared with corn cut and put immediately into the silo. There was moisture enough in the large stalks to bring it up to a very high temperature. The loss, this year, was merely nothing compared with the first we put up. Our cows did nicely on it. With that and millet they milked nicely, and rich milk with very little grain. This is a good and cheap ration. We are watching some cornfodder cut and put into the silo after the corn was husked. There was water added to make it heat. If it comes out all right we are going to try some. We shall use some of the larger corns, but not the Southern kinds. We think that, to save the corn and grind it, we will get better results. We have had good results from cut cornfodder in making butter; but, for flow of milk, the silage is ahead. We think highly of millet as a cattle food. It is an annual, of very rank and rapid growth, and very sensitive to chilly weather; will stand considerable heat and drouth. It is a shallow feeder, and will stand considerable crowding without injury. The seed will germinate with very little moisture, and will thrive on warm, dry land. Seems to not do well where the ground is wet, but will grow very fast after warm rains. Grown thinly, it grows very rank and coarse; but grown thickly, it grows finer and not so high, and heads not so long. When grown for hay, by thick seeding and on rich soil, it makes one of the best of foods, producing from two to four tons of sweet-smelling hay per acre. If cut early and well cured, it is relished by the cows, and produces a good flow of very rich milk. The richest milk we produced this season was from millet, fed without grain, being richer than that from silage, oil meal and wheat middlings. The best time to plow the land is as early as possible, then harrow occasionally to keep down the weeds, as land plowed early withstands the drouth better than land plowed in June, when often the soil is dry on top and turned under, and we do not get rain enough to thoroughly soak the soil. It seems to be a chronic affection of the weather to give us too little moisture through July and August, and too much early in the season. The seed bed must be made mellow by frequent harrowing, and free from lumps. The seed should be sown at the rate of three-fourths of a bushel per acre, and harrowed either with a brush or a smoothing harrow, not put in very deep, and the ground rolled to firm the soil and to break the lumps, so that they

will not rake up when you come to gather the crop. We made this mistake, and did not roll it, and it was a source of annoyance to us. We commenced to cut before all the heads were out, and the first we raked as soon as it was cut, and put into doodles. This we had to shake out again before it would dry; but the next we let wilt before putting into doodles, and then we let it stand out in the field two weeks, and it was cured out nicely—a little bleached on top, but not to hurt any. The rains do not go into the doodles at all, owing to the broad leaves. We had a very hard rain while it stood in the field, and we said to ourselves, "that rain must wet that millet thoroughly;" but were agreeably surprised that the rain had not penetrated the bunches more than half an inch. The bunches should be made very large, as they settle considerably. Millet parts with its water slowly, so that one must not be in any hurry about putting it into the barn.

Discussion.

Prof. Roberts. I was not well satisfied with ensilage when I first began to use it in the dairy, and I am not entirely satisfied yet. I am spending a good many dollars, year after year, to find out something about it. I cannot get along without the silo, though; it is much better than the old way. I believe we can have it a good deal better than it is. The most of our silage is too acid, and we cannot afford to buy sugar to sweeten it. I took a good deal of pains to learn about raising roots. Nine men out of ten plant mangolds two to four weeks later than they should. I learned the value of early planting from my grandmother. I noticed that as soon as the frost was out of the ground and the land could be worked at all, she went out and planted onions, lettuce, beets and peas. When you used to plant beets you said, every time you put a beet seed in, "as long as my leg and as thick as my thigh." Plant early. If I can get my beets up in May, before the weeds come, I have saved about one-half the cost of raising my roots. My largest yield was between 40 and 45 tons per acre. I would plant half of the yellow varieties, because they keep better. The red ones get good late in the spring. I can raise three tons of Giant variety easier than I can raise two tons yellow Globe, or one and a half tons of sugar beets.

Mr. Strohecker. Is it better to transplant from a seed bed?

Prof. Roberts. I never tried it.

Mr. Phelps. When I find anything that doesn't agree with me, I want to find out what is the matter. In the paper just read the writer commenced by branding bran and meal as no good. He said it wouldn't pay to buy the feed. I have had a different experience. It does pay to feed bran. I believe it pays to buy bran and oil meal, and it is something that must be had in some form. In regard to the value as a food and the manurial value—what you lose in the food value you make up in the manurial value. In feeding nitrogenous foods much is realized from the manure manufactured. There is no loss in it. In regard to the horse fork. Brother Orris said he would not use it; I would not be without it. In putting corn in the silo, I find that nothing can be gained by breaking off the ears of corn. It is only a waste of time. Put the whole crop into the silo. I had some very nice corn of the Leaming variety, and I thought I would snap the

ears off before putting it in the silo. We put the corn of six acres in the silo after they were snapped. Of course, nubbins went in with the stalks. After we had it in the silo, we brought in the corn and husked it and had 175 bushels of corn. I went and fed that corn, and it did not pay me at all. There was a loss of labor. So I say, just put it all in the silo at once.

John Smith. I would like to ask the clover man a question for information. In the matter of clover, I would like to ask if it is proper to cut hay after ten o'clock, and let it lie until the next day exposed to the weather?

Mr. Phelps. I don't exactly agree with Mr. Orris in curing hay. I don't agree with Prof. Roberts. I can't conceive of the policy of cutting down clover hay at ten o'clock in the morning and letting it lie until next day. I don't want it to receive that dew after it is wilted. It will bleach, too. I agree with Prof. Roberts in regard to cutting clover hay, until he commences to cut it. Commence after the dew is off, in a fair day, and about 5 o'clock, before the dew falls; put it up in small doodles and put the hay caps on. When we were in school we were taught that there was "no excellence without great labor;" and, when you get a first quality clover hay, you must put in a little labor. After I get my hay caps on, if it rains it is all right, and if it doesn't rain it is all right. I sent clear to Maine to get some hay caps, and they cost me 49 cents apiece at home. I have an idea, and I intend to follow it this summer. I have not enough hay caps. I shall make 400 or 500 hay caps this winter. I shall buy good, heavy muslin in the web, a yard and a half wide, and shall tear it into squares. I shall take and color them some dark color; and then, in the spring, I shall go to the creek and get some nice smooth stones, and will fasten one of those stones, weighing about four ounces, in each corner of the hay cap. Now, I have a pound of stone on my hay cap, and I shall then fold them up and lay them in my platform wagon, and when I am ready for them, I shall hitch my team to the wagon, and go and put on my hay caps. It doesn't make any odds how fine the weather is. I believe I shall get a good quality of hay.

John Fox. I have tried that, and have had trouble in keeping the hay caps on. They are bound to slip off, more or less. I have 60 of them myself.

Mr. Phelps. I staked them to the ground and they worked to a charm, last year.

Mr. Fox. When first putting on it is all right.

Prof. Roberts. There are as many ways of getting in clover as there are days in the clover season. A man must plan for the best. Farmers must use their brains in their work. In regard to raising roots, we find that carrots are good for horses and other animals as a condiment, but it costs about four times as much to raise them as it does to raise wurtzels, and they are not worth much more.

H. M. Cutshall. I wish to emphasize a point brought out by Mr. Orris in his essay. Farmers should raise all the grain possible on their farms. Don't rely upon buying; do that when you must.

Report of Committee on Dairy Implements.

Your committee beg leave to submit the following report:

The exhibition of dairy implements made at the nineteenth annual meeting of the Pennsylvania State Dairymen's Association, at Library Hall, in the city of Meadville, consisted of one Sharpless Improved Standard Russian cream separator, one United States cream separator and one Dr. Babcock's milk test. Of the former we cannot say much, as the machine could not be exhibited in operation, for the reason that it is designed to be run by steam, and there was no steam available. This machine is driven by a steam jet striking a bucket-ring, attached to the bowl. No engine or gearing of any kind is required, only connection with a steam boiler and the bowl, and its spindle alone revolves the latter in a chamber of oil, making constant and positive lubrication.

The manufacturer of this machine claims the greatest simplicity yet obtained in a centrifugal cream separator; and, consequently, the greatest economy in fuel, wearing parts and the use of oil, together with many other advantages in the working of the machine which would render it well worthy the attention of dairymen. The capacity of the separator shown is represented to be from 1,000 to 1,500 pounds per hour, according to the condition of the milk. The machine appears to be neatly and substantially built, and occupies but little space.

The Vermont Machine Company exhibited one of their separators, size No. 6, a hand machine for separating the cream. It is to be regretted that your committee was unable to see a practical test of the machine. There was no lack of power to run it, as it was a hand machine, but there was no milk to supply it; therefore, your committee can say but little about its merits. The same firm also exhibited one of Dr. Babcock's milk test, and demonstrated its workings by testing six samples of milk, with the following results: No. 1 shows 4 pounds of butter to 100 pounds milk; No. 2, 3 2-10 to the same quantity; No. 3, 5 2-10; No. 4, 3 2-10 pounds; No. 5, 3 2-10 pounds; No. 6, 3 3-10 pounds. The machine worked perfectly, and demonstrated to the satisfaction of your committee that no dairy or factory should be without one of these milk tests. All of which is respectfully submitted.

C. W. HEYDRICK,
E. W. SHIPPEN,
Committee.

Prof. H. P. Gurler, of the Pennsylvania Dairy School, gave an extended lecture on the dairy work of the college, which, to our regret, was not fully reported, because we thought it would be submitted in manuscript, and discovered the mistake when too late to rectify.

The following tables were used in his work to exhibit the results obtained in skimming and churning cream. They contain information that is practical to the experienced dairyman.

TABLES SHOWN BY PROF. H. P. GURLER, PENNSYLVANIA STATE COLLEGE.

Skimming.

DATE.	Rate per hour. Pounds.	Temperature of milk.	Fat in milk.	Fat in skim- med milk.	Skimmed milk for pound fat.
January 17,	2,010	84	4.2	.01	10,000
" 18,		85	4.1	.01	10,000
" 19,	1,731	84	4.3	.005	20,000
" 20,	1,950	84	3.8	1.0	10,000
" 21,	1,992	85	3.9	.005	20,000
" 23,	1,811	85	4.4	.001	10,000
Average,	1,899	84.5	4.1	.0066	28,333½

Churning.

DATE.	Fat in cream.	Temperature of starting.	Temperature gathered.	Fat in butter- milk.	Buttermilk for pound of butter fat.
January 9,	33	40	52	.001	100,000
" 10,	23	43	52	.05	2,000
" 11,	25.2	44	55	.03	3,333½
" 12,	29.4	50	58	.07	1,429
" 17,	16.8	58	62	.30	333
" 18,	20.5	50	60	.10	1,000
" 19,	23.7	47	57	.10	1,000

Summary.

	Loss in skimming.	Loss in churning.	Total loss pounds fat.	Total loss dollars.
Dairy school,	210	181.5	392	\$98 06
Creamery average,	5,840	2,737	8,577	2,144 25
Difference,	5,630	2,555.5	8,185	2,046 19

The reports of the other committees were submitted, the officers elected, and the sessions were adjourned to the call of the executive committee.

IMPROVEMENT OF ROADS.

By JOHN ROBINSON.

Whenever any public improvement is thought of that is intended for the benefit of the farmer, the first thing that he thinks of is the tax that he will be forced to pay for the support of such an improvement. This question is now occupying the minds of some of the great men of our land.

The latest phase of the agitation of road improvement is the formation is now occupying the minds of some of the great men of our land.

The importance of this movement cannot be over estimated. The public sentiment in favor of road reform is profound and universal, but as to exact methods and ways and means, it is all at sea, and brings no practical influence to bear anywhere. If it can once be massed and crystallized upon definite measures, it will be irresistible. This can only be accomplished by organization, reaching every interest concerned, and especially the farmers.

Heretofore, the latter have held somewhat aloof from the movement, under the apprehension that the chief burden of rebuilding roads would fall upon them, and be more than they could bear; but if they take advantage of this opportunity, and organize in every school district, they will be in a great majority in the National League, and safe from any adverse action; while they will have the satisfaction of being largely their own deliverers.

They can be assured in advance that their labor will not be in vain, and that, in the multitude of council, means will be found satisfactory to them to accomplish the work, and distribute its burdens. When they decide what they can do and what help they want, that help will be forthcoming. Already various plans for State and National aid to road-building have been proposed, and received with favor, and it only requires thorough discussion to develop others, and decide upon the best.

When this end is gained, and the people speak with one voice, legislation will be easy, and the work for good roads, being "well begun," will be "half done."

The objects of the National League for Good Roads is to awaken general interest in the improvement of public roads; to determine the best methods of building and maintaining them; to secure the legislation, state or National, that may be necessary for their establishment and support, and to conduct or foster such publications as may serve these purposes. The league shall be organized in the school district or other local division of each state, and its membership shall be open to all citizens. There shall be no initiation fee or membership dues, but each member shall pay 50 cents per annum as a subscription, at club rates, for the publications of the National league.

Within the past year, through the special reports of our consuls abroad, many persons have discovered that all over the world the common roads are among the prime concerns of the national government alike under monarchies and Republics, and are asking the pertinent question, "Why cannot the Government of this great Republic do

what other governments are doing for the people's benefit?" But, when you address their questions to Congress, the natural answer is, "We are here to make laws, not revolutions." And so vast a change is this, reversing the settled policy of fifty years, and involving the expenditure of thousands of millions of money, must be fully wrought out of the minds of the people, and its leading details fixed upon, before we can possibly begin to act upon it.

Here, then, is the greatest need of a complete organization of all the workers in this great cause, and the reason that such organization should extend into the school districts of the land. The best thought of the whole Nation is required in developing or choosing a plan of action, and the solid support of the people is required when the plan is found. Neither of these can be had without organization.

When the subject has been discussed in school district assemblies, in town meetings, in county conventions, and in state and National road congresses, a final conclusion reached, and that conclusion sent back to the school district and confirmed, we shall then have come as near as possible to a people's solution of the problem. When this solution is reached, the legislation to put it into effect can be had for the asking.

Nothing is more powerful in this country than votes, except more votes. A million voters, asking with one voice for anything that is reasonable, will not be denied by all parties, if by either; and a million in all is only four to a school district.

For good roads we should be able to unite two million or three million or four million. What school district could not muster its sixteen recruits for this peaceful campaign of progress and reform?

One hundred years ago roads were unknown. In 1805, and later years, the mail was carried on horseback long distances along the poorest roads. On July 8, 1812, books were opened for subscription to the Susquehanna and Waterford turnpike. Other turnpikes were projected in time, and the way opened for staging and travel. The National Government, at that time, made great appropriations for the building of highways, but when the railroads made their appearance, the question was dropped. And to this day the method of repairing roads by piling heaps of mud and sod in the centre of the road, thereby making it worse than it was in the first place, has been strictly carried out to the letter. There has been no progress, to speak of, in the methods of building and maintaining roads in the United States in the last century.

A Spanish writer of olden time pictured the great road to Cusco in this lofty language: "I believe that in all the history of man there has been no account of such grandeur as is to be seen in this road, which passes over deep valleys and lofty mountains, by snowy heights, over falls of water, through live rocks, and along the edges of furious torrents; in all places level and paved, along mountain slopes terraced, through the living rock cut, along the river banks supported by walls, in the snowy heights with steps and resting places, in all parts ten paces wide, clean swept, clear of stones, and, at intervals, post houses and store houses, and temples of the sun." And this road would have reached from Boston to the Mississippi, or from Duluth to the Gulf of Mexico. If we could bring this writer back to earth, with

these memories fresh upon him, and put him down in the middle of a Crawford county road in the early spring, how would he picture the scene, and what age of the world would he take it to be, and what kind of crawling creatures its inhabitants?

It would be folly to attempt a solution of the problem in advance of the National discussion, were it not that many of our friends were so appalled by the magnitude of the undertaking, and altogether so hopeless, that some light ahead is needed even to draw them into the organization, and it may be the duty of those who think they see daylight, to point it out. I venture, therefore, to repeat some of the suggestions which were made to the Missouri convention, and which found so much favor among the farmers there as to capture that assemblage almost bodily for National aid; and, speaking of the farmers, I will say here, we cannot blame them for going slow in this matter. They want to be sure that in getting rid of the burden of bad roads, they will not be taking up a heavier burden of taxation, and they are entitled to full assurance on this point. The farmer and his family suffer most of the miseries of bad roads, it is true; but the pecuniary loss is fully shared by the people in towns and cities, and the remedy should not be disproportionately at the farmers' cost.

It is impossible to raise the amount of money needed by taxation. It is unjust to raise it on short loans, and thus compel one generation to bear the burden of a work that is done for all time, and it is the height of folly to use the lowest form of public credit, and pay a high rate of interest, when the highest form and the lowest rate in the known world are at our command. Long loans, at low rates, are only possible through National credit. Counties could borrow limited amounts on short time, at about double the National rates, but their bonds would be a drug on the market before the work was well begun. The states could do a little better; but their varying credit would impose unequal burdens upon the people, while those states most needing the improvement would be least able to secure the means. Even with National financiering, there are dangers and difficulties to be met in so vast an undertaking. A sudden change from a decreasing to an increasing National debt, with no certain limit in sight, would shake even our credit.

If, however, instead of increasing its own debt, the Nation could accomplish the same result by giving its guarantee to local debts, and could be protected by solid security against any ultimate loss through that guarantee, the National credit would probably not suffer more, through the contingent liability incurred, than it would gain by the resulting increase in National wealth, while the local communities would get the full benefit of the present high standing of the Nation in the money markets of the world.

On what basis could such an arrangement be effected? In the National road building, which occupied the attention of Congress for the first third of this century, and which preceded National river and harbor improvement by nearly twenty years, the Government paid the entire cost, and built trunk lines of road only. If National work were now to be resumed, the changed conditions would dictate another policy. The railroads serve the purpose of trunk lines, and the interest of the Government is in the general improvement of local roads for

postal and military uses, and the general welfare, and its aim should be to stimulate local effort by means of the least modicum of National aid, so administered as to be of the greatest effect.

To avoid local jealousies and log-rolling legislation, this aid should be offered freely to all who will accept its conditions. As to these are equally concerned, and they agree to contribute each one-fourth conditions, let us suppose that the Nation, state, county and township to pay the interest and sinking-fund charges on an issue of county bonds for road improvement; that the work is to be done under their joint supervision, and under the head of a competent superintendent for each county, who understands how to build and maintain a macadamized road, and the township supervisors shall be under the control of the county superintendent.

We may add here that the farmer shall be given the first chance of employment in the building of these roads in his locality, and shall receive his daily wages, thereby giving him the privilege of earning enough money to pay his tax in cash.

The bonds are first to be guaranteed by the state and then by the United States, the sinking fund to be placed under Government control; the amount of bonds limited to a fixed percentage of the value of real estate in the county, as determined by a National assessment; if necessary, the roads themselves mortgaged to the United States as security for its guaranty, with power to take tolls, in case of default. With these safeguards, the Nation would seem to risk nothing, while giving the benefit of its unimpaired credit to the counties and states.

It has been figured out by Gen. Roy Stone, of New York, that this can be done, and the entire principal and interest be paid in seventy-two years, and not cost the farmers one cent more than it does to-day, when they go out and make mud pies in the middle of the road; and they could even take a pleasure drive at any time of the year, and glide over the smooth, macademized surface of our country roads, the same as they do in France and England to-day. Show me the man who would not be willing to pay his tax in cash, should such a condition of our public highways be brought about? I am quite aware that to you so bold and radical a departure as this will bring a cold shiver, like a plunge into unknown waters, and I hasten to say that no one proposes to commit the National League to this or any other plan, nor even to solicit the adoption of any plan, and it may even be found that direct National aid may not be needed at all; but, on the other hand, I hold that nothing is more absurd than to talk of the danger of suggesting such revolutionary ideas to the American public.

REPORT
OF THE
State Horticultural Association
OF PENNSYLVANIA,
FOR 1893.

CONSTITUTION.

Article 1. This society shall be entitled "The State Horticultural Association of Pennsylvania," and its object shall be the advancement of the science of horticulture and pomology.

Article 2. Any person may become a member of this society by a vote of a majority of the members present, at any meeting, and by paying into the treasury the sum of one dollar annually; or the payment of one dollar to the treasurer, at any time, shall constitute membership, and entitle said member to a copy of the proceedings. The payment of ten dollars at one time will constitute life membership.

Article 3. Its officers shall consist of a president, three vice presidents, a recording and corresponding secretary and a treasurer, all of whom shall be elected annually by ballot.

Article 4. The following committees shall be appointed: A committee of five on nomenclature; a committee of three on insects, of whom the professor of entomology shall be chairman; an executive committee consisting of the elective officers of this association and three of whom, including the president, shall constitute a quorum; and a general fruit committee, consisting of one from each county represented, with a general chairman of the whole, each member of the fruit committee to have the privilege of appointing two assistants.

Article 5. The society may, at any time, elect honorary members.

Article 6. The society may, from time to time, appoint professors on entomology, botany, horticultural chemistry and geology.

Article 7. This constitution may be altered or amended by a vote of two-thirds of the members present at any regular meeting, notice of the proposed amendment, in writing, having been previously given.

Article 8. Seven members shall constitute a quorum for the transaction of business.

BY-LAWS.

Article 1. The committee on nomenclature shall collate and decide the standard and synonymous names of all fruits known in the society with the authorities for each, and report, so far as practicable, at each regular meeting, and record the same in a book kept for that purpose.

Article 2. The general fruit committee shall carefully and thoroughly investigate the subject of fruit culture in general. Each local committee of three shall collect such useful and interesting information in relation to the subject as may be in their power, and embody the same in monthly reports, to be made to the general chairman; such reports to be by him examined and embodied in his annual and semi-annual reports. Also that the said county committee shall form ad interim committees for their respective counties; and further, that said ad interim committees are hereby authorized to publish the reports in the "Gardener's Monthly," or such other paper as they may select, the same having been first submitted to the chairman of the general fruit committee for his approval: Provided, That said publication shall be free of expense to the association.

Article 3. The annual meeting of the association shall be held on Tuesday before the third Wednesday of January of each year, at such a place as the executive committee may appoint, at which time the election for officers shall take place; said officers to serve from the close of the meeting at which they are elected to the close of the succeeding annual meeting, at which an exhibition and discussion of fruits shall take place and other business transacted in the following order:

- 1st. Reading of minutes of previous meeting.
- 2d. Roll call and dues collected.
- 3d. Election of officers.
- 4th. Reports of officers.
- 5th. Reports of standing committees.
- 6th. Reports of special committees.
- 7th. Unfinished business of former meeting.
- 8th. New business.

The nomination and election of new members shall be in order at any time during the session.

Article 4. Other meetings may be convened by the executive committee at such time and place as they may appoint.

Article 5. No member who is in arrears for dues shall be eligible for any office, or serve on any standing committee; and any member who shall neglect to pay his dues shall cease to enjoy the privileges of membership.

Article 6. A library shall be established for the benefit of the members of this association, and a librarian elected annually with other elective officers.

Section 1. The librarian shall keep an alphabetical record of the books, etc., and may loan to any member of this association any books contained therein without cost: Provided, That it be returned within three months, and in as good condition as when received.

Section 2. Any member refusing to return to the librarian any books or reports from said library, shall pay their equivalent, or forfeit his membership.

LIST OF OFFICERS FOR 1893.

President.

W. H. MOON, Morrisville.

Vice Presidents.

JOSIAH HOOPES, West Chester.

H. M. ENGLE, Marietta.

J. T. SMITH, Swales.

Recording Secretary.

E. B. ENGLE, Waynesboro.

Corresponding Secretary.

W. P. BRINTON, Christiana.

Treasurer.

J. HIBBERD BARTRAM, Milltown.

Librarian.

THOMAS J. EDGE, Harrisburg.

Professor of Botany.

THOMAS MEEHAN, Germantown.

Professor of Horticultural Chemistry.

S. B. HEIGES, York.

Professor of Ornithology.

Dr. B. H. WARREN, West Chester.

Chairman General Fruit Committee.

CYRUS T. FOX, Reading.

COMMITTEES FOR 1893.

GENERAL FRUIT COMMITTEE.

CYRUS T. FOX, *Chairman*, Reading, Berks county, Pa.

COUNTY.	MEMBERS.	P. O. ADDRESS.
Adams,	J. V. Garrettson,	Flora Dale.
Allegheny,	E. P. Swift,	Mount Oliver.
Armstrong,	J. Donaldson,	Kittanning.
Beaver,	A. L. McKibbin,	Green Garden.
Bedford,	J. Z. Replogle,	New Enterprise.
Berks,	C. T. Fox,	Reading.
Blair,	F. Jaekel,	Holidaysburg.
Bradford,	R. M. Welles,	Towanda.
Bucks,	Henry W. Comfort,	Falsington.
Butler,	W. H. H. Riddle,	Butler.
Cambria,	J. V. Mancher,	Carrollton.
Cameron,	F. G. Judd,	Emporium.
Carbon,	E. Bauer,	East Mauch Chunk.
Centre,	Prof. George C. Butz,	State College.
Chester,	J. W. Pyle,	Willow Dale.
Clarion,	J. H. Patrick,	Clarion.
Clearfield,	Samuel Hall,	McGee's Mills.
Clinton,	Joel A. Herr,	Cedar Springs.
Columbia,	J. K. Sharpless,	Catawissa.
Crawford,	James Turner,	Meadville.
Cumberland,	H. S. Rupp,	Shiremanstown.
Dauphin,	Gabriel Hiester,	Harrisburg.
Delaware,	Samuel Larkin,	Booth's Corner.
Elk,	W. H. Johnson,	Benezett.
Eric,	G. A. Evans,	West Mill Creek.
Fayette,	George Hopwood,	Uniontown.
Forest,	J. B. Agnew,	Tionesta.
Franklin,	Dr. B. L. Ryder,	Chambersburg.
Fulton,	B. C. Dawney,	Hustontown.
Greene,	L. W. Gwynn,	Carmichaels.
Huntingdon,	G. W. Owens,	Birmingham.
Indiana,	J. P. Stuchul,	Indiana.
Jefferson,	S. H. Whitehill,	Brookville.
Juniata,	J. E. Jamison,	McAlisterville.
Lackawanna,	A. C. Sisson,	La Plume.
Lancaster,	Daniel D. Herr,	Lancaster.
Lawrence,	Samuel McCreary,	Neshannock Falls.
Lebanon,	Henry C. Snaveley,	Lebanon.
Lehigh,	W. B. K. Johnson,	Allentown.
Luzerne,	P. Sutton,	Exeter.
Lycoming,	Peter Reeder,	Hughesville.
McKean,	A. J. Hughes,	Port Allegany.
Mercer,	W. H. McKean,	Mercer.
Mifflin,	Henry Ort,	Lewistown.
Monroe,	R. F. Schwarz,	Analomink.
Montgomery,	H. W. Kratz,	Norristown.
Montcur,	W. M. Gearhart,	Danville.
Northampton,	A. S. Shimer,	Redington.
Northumberland,	John Hoffa,	Milton.
Perry,	M. B. Eshelman,	Newport.
Philadelphia,	T. B. Meehan,	Germantown.
Pike,	Edgar Pinchot,	Milford.
Potter,	E. O. Austin,	Austin.
Schuylkill,	W. A. Stout,	Pinegrove.
Snyder,	J. F. Boyer,	Mt. Pleasant Mills.
Somerset,	D. J. Horner,	Somerset.
Sullivan,	E. A. Strong,	Dushore.
Susquehanna,	R. S. Searle,	Montrose.
Tioga,	S. M. Baker,	Brookfield.
Union,	S. C. Sheller,	Lewisburg.
Venango,	J. Miller,	Franklin.
Warren,	W. Cowan,	Warren.
Washington,	Pressly Leach,	Burgettstown.
Wayne,	Theodore Day,	Dyberry.
Westmoreland,	A. Ruth,	Scottdale.
Wyoming,	N. A. McKown,	Tunkhannock.
York,	Samuel Small, Jr.,	York.

COMMITTEES FOR 1893.

COMMITTEE ON NOMENCLATURE.

H. A. Chase, Chairman, Philadelphia.	J. T. Smith, Juniata county.
Geo. D. Stitzel, Berks county.	Edwin W. Thomas, Montgomery county.
Geo. A. Wagner, Perry county.	

COMMITTEE ON FLORICULTURE AND ABORICULTURE.

William H. Moon, Chairman, Bucks co.	George Achells, Chester county.
P. C. Hiller, Lancaster county.	John C. Cullen, Northampton county.
John C. Helper, Berks county.	

COMMITTEE ON ENTOMOLOGY.

Herman Strecker, Berks county.	Ezra High, Chairman, Berks county.
--------------------------------	------------------------------------

COMMITTEE ON ARRANGEMENT AND RECEPTION.

George D. Stitzel, Chairman, Reading.	H. C. Snavelly, Lebanon.
Henry Eppshimer, Reading.	E. B. Engle, Waynesboro'.
Cyrus T. Fox, Reading.	

LIFE MEMBERS.

Bartram J. Hibberd, Milltown, Chester county.	Hacker, William, Philadelphia.
Brinton, W. P., Christiana, Lancaster county.	Hoopes, Josiah, West Chester, Chester county.
Calder, Rev. James, Harrisburg, Pa.	Hiller, Casper, Conestoga, Lancaster county.
Chase, H. A., 1130 S. Penn square, Philadelphia.	Hiller, Peter C., Conestoga, Lancaster county.
Cornelius, Robert, Philadelphia.	Landis, Israel, Lancaster, Lancaster county.
Engle, J. G., Marietta, Lancaster county.	Martin, J. O., Mercersburg, Franklin county.
Engle, H. M., Marietta, Lancaster county.	Pannebaker, William M., Lewistown, Mifflin county.
Engle, E. B., Waynesboro, Franklin county.	Reist, Peter S., Lititz, Lancaster county.
Ermentrout, Hon. James N., Berks county.	Scribner, Prof. F. Lamson, Knoxville, Tenn.
Fox, Cyrus T., Reading, Berks county.	Shaffner, Jacob, Harrisburg, Dauphin county.
Garretson, Joel V., Bigler, Adams county.	Swift, E. P., Mount Oliver, Allegheny county.
Hayes, Charles P., 149 North Fifteenth street, Philadelphia.	Thomas, George B., West Chester, Chester county.
Heyser, Jacob, Chambersburg, Franklin county.	Thomas, Edwin W., King-of-Prussia, Montgomery county.
Hildrup, W. T., Harrisburg, Dauphin county.	Van Deman, H. E., Washington, D. C.

HONORARY MEMBERS.

Barry, P., Rochester, N. Y. (deceased).	Rowe, Hon. D. Watson, Chambersburg, Pa.
Downing, Charles, Newberg, N. Y. (deceased).	Rutter, John, Muncy, Pa.
Ellwanger, George, Rochester, N. Y.	Saunders William, Washington, D. C.
Garber, J. B., Columbia, Lancaster county, Pa. (deceased).	Stitzel, Hon. George D., Reading, Pa.
Meehan, Thomas, Germantown, Pa.	Thomas, John J., Union Springs, N. Y.
Michener, Dr. E., Toughkenamon, Chester county, Pa. (deceased).	Warder, Dr. John A., North Bend, Ohio (deceased).
Parsons, S. B., Flushing, N. Y.	Willetts, Rev. Dr., Philadelphia.
Parry, William, Parry, N. J. (deceased).	Wilder, Hon. M. P., Boston, Mass (deceased).
Rathvon, Prof. S. S., Lancaster (deceased).	Wickersham, Dr. J. P., Lancaster, Pa. (deceased).

ANNUAL MEMBERS.

- Baer, J. C., Hamburg.
Barnhart, W. R., Greensburg.
Burkey, Joshua R., Reading.
Butz, Prof. George C., State College.
Benninger, W. M., Walnutport.
Bernhart, Major F. S., Reading.
Bickle, Isaac, Reading.
Blankenbiller, J. R., Angelica.
Boyer, Jerome L., Reading.
Brenelser, Charles, Reading.
Bretz, William, West Fairview.
Bretz, W. C., Camp Hill.
Briggs, W. H., Carrick.
Brinser, E. C., Middletown.
Brumbaugh, A. J., Reading.
Bucher, Riley, M. D., Lebanon.
Campbell, John A., Belleville.
Cocklin, E. H., Bowmansdale.
Comfort, H. W., Fallsington.
Comfort, J. R., William Penn.
Cooper, Calvin, Bird-in-Hand.
Davis, Edwin, Thompsontown.
Day, Theodore, Dyberry.
Donmoyer, M. T., Kutztown.
Eby, Simon P., Lancaster.
Edge, Thomas J., Harrisburg.
Endlich, G. A., Reading.
Engle, Ezra B., Marietta.
Eply, Horace, York.
Eppihimer, Henry, Reading.
Eshleman, M. B., Newport.
Fahrenbeck, Geo. D., Bernville.
Fegely, Albert H., Reading.
Fetter, I. C., Reading.
Gaul, James W., Vinemont.
Gross, Geo. W., York.
Griesemer, Charles A. Z., Reading.
Harnish, H. H., Chestnut Level.
Hartman, Frank S., Tuckerton.
Harper, William Warner, Chestnut Hill, Philadelphia.
Hartzler, J. K., McVeytown.
Hawley, Jesse G., Reading.
Helges, Prof. S. B., York.
Hendel, Henry B., Reading.
Hepler, John C., Reading.
Herr, Daniel D., Lancaster.
Herr, Aldus J., Lampeter.
Herr, D. H., Lancaster.
Hertzler, S. A., Strode's Mills.
Hertzler, John, Sr., Port Royal.
Hiester, Gabriel, Harrisburg.
High, Ezra, Reading.
Hope, Adam H., Bondstown, York co.
Hoffa, John, Milton.
Hoy, Thomas, Orwigsburg.
Ingram, Edward T., West Chester.
Jameson, J. E., Swales.
Kaufman, Cyrus W., Reading.
Keim, Issac W., Reading.
Keller, Col. D. C., Reading.
Kendig, M. D., Creswell.
Keppel, Samuel B., Sinking Springs.
Kershner, George W., Reading.
Kindt, S. S., Reading.
King, James P., 3316 Market st., Phila.
Kohler, H. W., Brillharts.
Kolp, Martin, Elizabethtown.
Kraemer, Louis, Reading.
Kready, John, Mount Joy.
Lauer, George F., Reading.
Lantz, J. C., Thompsontown.
Leinbach, Joseph A., Reading.
Leinbach, George A., Reading.
Livingood, Frank S., Reading.
Longsdorf, C. L., Flora Dale.
McGowan, James, Geiger's Mills.
March, Issac F., Birdsboro.
Marks, Levi, Reading.
Meehan, Thomas B., Germantown.
Mengel, Levi W., Reading.
Meredith, S. M., Reading.
Merritt, Hon. Thomas P., Reading.
Mohn, John G., Reading.
Moon, W. H., Morrisville.
Moyer, John M., Beckersville.
Muhlenberg, H. A., Reading.
Nolan, William, Reading.
Northup, H. W., Glenburn.
Obold, John, Reading.
Obold, John H., Reading.
Ort, Henry, Lewistown.
Page, B. W., East Salem.
Patterson, J. G., Stewartstown.
Pyle, J. W., Willow Dale.
Rakestraw, Thomas, Willow Dale.
Reber, Henry C. G., Reading.
Reeser, Jarius H., Athol.
Rife, Jacob L., West Fairview.
Ritter, Milford N., Reading.
Rupp, H. S., Shiremanstown.
Rush, J. G., West Willow.

Ryder, Dr. B. L., Chambersburg.
Sallade, Wm. H., Topton.
Schaeffer, Rev. N. C., Kutztown.
Scheidy, Daniel, Pinegrove.
Schwarz, R. F., Analomink.
Schweyer, D. H., Bower's Station.
Schock, Oliver D., Hamburg.
Scholl, Dr. Wm. H., Reading.
Seyler, D. M., Basket.
Sharpiess, J. K., Catawissa.
Shimer, A. S., Redington.
Shoemaker, R. C., Jarrettown.
Seidel, Franklin, Maiden Creek.
Smeych, Daniel, Lancaster.
Smith, J. T., Swales.
Smith, F. Leaf, Reading.
Snaveley, H. C., Lebanon.
Spanogle, H. A., Lewistown.
Spanogle, Andrew, Lewistown.
Stahle, Col. A. J., York.
Stambaugh, H. A., Mifflintown.

Stetson, P. R., Reading.
Stout, W. H., Pinegrove.
Stauffer, A. K., Reading.
Swigert, S. J., Lewistown.
Thomas, Joseph W., King-of-Prussia.
Tyson, H. S., York.
Van Reed, Wellington, Reading.
Wagner, George A., Alinda.
Weber, Phillip, McAllisterville.
Wentzel, Aug. L., Reading.
White, Rev. J. W., Milroy.
Whitmer, George K., Reading.
Williamson, Edward, Morrisville.
Woods, T. A., Harrisburg.
Wynnings, Roy, Lebanon (to 1892 inc.)
Yeager, A. H., Greenland.
Young, Andrew M., Wormelsdorf.
Young, J. Gerhart, Reading.
Zerr, E. M., Geiger's Mills.
Ziegler, Amos, Rowenna.

STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

Viewed from the standpoint of attendance and interest manifested, the thirty-fourth annual meeting of this society, which was held in the Supreme Court room, Harrisburg, Pa., January 18th and 19th, 1893, will be remembered as one of the most satisfactory and profitable ever held at the State Capital. The address by Governor Pattison; the very full and exhaustive presentation of the subject of "Peach Yellows and Plant Diseases" by Dr. Smith, of the Department of Agriculture at Washington; the illustrated lecture by Secretary Edge, of the State Board of Agriculture, on "Fertilizer Brands and their Meaning;" the full and able report of Chairman Fox, of General Fruit Committee, were among the prominent features of the several sessions. The display of fruits was meagre owing to the general failure of the crop of '92. The following new names were added to the list of active members for 1893:

J. R. Blankenbiller, Angelica.
Jerome L. Boyer, Reading.
W. C. Bretz, Camp Hill.
Geo. D. Fahrenbach, Bernville.
Frank S. Hartman, Tuckerton.
H. H. Harnish, Chestnut Level.
Edward T. Ingram, West Chester.
Levi W. Mengel, Reading.

R. F. Schwarz, Analomink.
Danl. Scheidy, Pinegrove.
H. A. Spanogle, Lewistown.
Dr. Wm. H. Scholl, Reading.
D. M. Seyler, Basket.
Rev. N. C. Schaeffer, D. D., Kutztown.
E. M. Zerr, Geiger's Mills.

THE MEETING.

Promptly at two o'clock President Moon called the members to order, and announced that the association was ready for business. After reading minutes of last annual meeting and approval of same, the following were appointed a committee to nominate candidates for the several offices for 1893:

H. S. Rupp, Joseph W. Thomas, H. A. Chase, H. M. Engle, J. E. Jamison.

Cyrus T. Fox, chairman, read the following:

REPORT OF GENERAL FRUIT COMMITTEE.

To the officers and members of the State Horticultural Association of Pennsylvania:

Gentlemen: In regard to the fruit results of 1892, your chairman of the General Fruit Committee would report having received replies to his queries, sent out on December 1, from every county in the State except six. The counties which failed to report are mostly in the

mountain districts, where no attention, or practically none, is paid to fruit growing. From one county, Forest, the circular of your committee was returned without any of the queries having been answered. This county is a lumbering district and is well named. It produces good crops of beech nuts and acorns, but even these crops are reported to have failed in that section of the State last year. The season of 1892 was unfavorable for the fruit grower, largely due to the exceedingly abundant crops of the previous year. From the reports received your chairman has compiled the following information:

Apples.

The apple crop, with but few exceptions, was remarkably poor throughout the State, both as to quantity and quality. In some localities orchards were found which bore fair crops, but they were mostly orchards which had very little fruit in 1891. The ravages of the codling moth, where spraying was not observed, or owing to wet weather, proved unsuccessful, left but little perfect fruit. Some orchards in Berks county, for instance, bore largely, and in several districts more cider was made than in the previous year, but the quality of the fruit was very inferior, and perfect specimens were rare. Apples native to their localities did better than foreign varieties. The Keim and Krauser in Berks, which originated in the county, yielded well. Adams and York counties report that the York Imperial, a native of the latter county, did much the best. The same can be said of other native fruits, showing the importance of paying greater attention to the raising of varieties which are thoroughly acclimated. Where there was a fair crop, the fruit dropped early owing to a hot and dry period during August and September. The fruit also rotted badly, and the keeping qualities were poor.

In some sections of central Pennsylvania there was a good average crop. The heaviest yielders were the Baldwin, Russets, Winesap, Romanite and Ewalt. In the Cumberland Valley, especially in some favored localities, there was a comparatively good crop of apples, and the fruit was of fairly good quality, though many specimens were faulty. Good, solid winter fruit sold in that valley for 50 to 60 cents per bushel about the first of December. Lycoming county reported a good yield, quality fair and apples keeping very well. Luzerne, a large crop, but poor in quality. Monroe a wonderful yield and quality excellent. Pike, the largest crop in many years and quality good, but not keeping as well as usual, the cause being attributed to early ripening. Susquehanna and Tioga, a fair average yield, but quality rather below the average. Union, a very heavy yield of apparently fine fruit, but it rotted badly after having been gathered. The districts just mentioned were the favorable exceptions. All other counties in the State reported the yield to have been one-half a crop, or less, and the quality inferior.

Pears.

Pears did better than apples, and in many counties of the State there was an average yield. The condition of the fruit was also quite fair. There was less blight than usual. In the eastern section of the State there was nearly a full crop, except where the trees were dam-

aged by the overabundance of 1891. Kieffer and Seckel did well. The Lawrence fell prematurely and did not ripen well. Throughout central Pennsylvania there was a good yield in general, although cold rains during the blossoming period curtailed the crop in some counties. The Windsor, or Summer Bell, bore heavily. Clapp's, Bartlett, Vicar, Seckel, Beurre Clairgeau and Kieffer gave large returns of fine fruit. In southern Pennsylvania there was a light yield, and the fruit somewhat imperfect, whereas in the northern counties the yield was large, and fruit fine, with no damaging causes except blight in a few localities. In western Pennsylvania the yield was rather below the average generally, and several counties reported only half a crop. Of the kinds that did best in that section of the State may be mentioned the Bartlett and Seckel, the latter having been especially fine. In regard to the newer pears, a report was received from the experimental grounds of the Pennsylvania State College, representing the Lawson to be "very pretty, very good, early and seedless." The Kieffer was an improvement over former years in the experience of Casper Hiller, of Lancaster, and is pronounced by him as "a good canning pear," a statement which everybody knowing anything about this variety will endorse. LeConte fruited with him for the first time in four years and proved to be good. Daniel D. Herr, of the same county, says: "Kieffer has come to stay. I intend to plant a good many more trees."

Peaches.

The raising of peaches in Pennsylvania will be a thing of the past unless great care is taken. There are now only a few favored peach belts in the State which have escaped the "yellows," and unless steps are taken to enforce the law of 1891, they will share the fate of other sections of the State where peaches, years ago, were a sure and most valuable crop, but where scarcely a healthy, bearing tree can now be found. The law will be practically a dead letter unless organized efforts are made for its enforcement. The peach growers of Franklin county held a meeting soon after the law had been approved by the Governor, and formed an association to carry out its provisions. Commissioners were appointed who served one year, during which time they condemned a number of trees and compelled the owners to destroy them. Some opposition was manifested, and considerable ill-feeling caused, and the commissioners refused to serve a second year. In the Juniata peach district the beneficial character of the law was recognized, and without waiting for its machinery to be put in motion the growers cut down many of their old trees which had exhibited symptoms of the disease, and burned them. If growers in other sections of the State did the same, there would be no necessity of appointing commissioners, but the love of the almighty dollar exerts too potent an influence, and for the sake of realizing a little lucre from the shrunken fruit of diseased trees, the trees are allowed to stand until all in the orchard are similarly attacked. Thus the disease spreads until the blight affects an entire neighborhood. Delaware has experienced the same difficulty as Pennsylvania in regard to enforcing the law, and at a meeting last week of the peach growers of that State, a committee was appointed to see that it is faithfully

executed. This is the only salvation for the peach crop of Delaware, as within the past few years the "yellows" has attacked orchard after orchard until but few sound trees can be found. The presence of Dr. Smith, of the Pathological Division of the Bureau of Pomology of the United States Department of Agriculture, at the present meeting of our association, cannot but be beneficial, as he will be able to show the infectious character of this disease, and how it can be transmitted by inoculation, and will be able to point out measures to prevent its general dissemination.

This, by way of prelude to the presentation of a summary of the reports in regard to the peach crop. The crop was very light throughout the State and the peaches were of poor quality except in the Franklin county district, where there was a good crop generally, and in the Juniata valley, where there was a good half crop. The quality was good and the fruit ripened well. The best varieties were Stump, Mountain Rose, Crawford's Late, Smock, Beer's Smock, Globe and Ford's Late. Contrary to the usual order of things late peaches did not bring as good prices as medium and early varieties. Trees on high lands produced a good average crop in some localities, while in the same neighborhood trees in the low lands were a perfect failure. E. C. Brinser, of Middletown, makes an interesting report in regard to his orchard, now four years old. The crop was a good one. From 250 trees he obtained about 250 baskets. Old Mixon, Early York, Troth's, Salway, Stump, Smock, Crockett's Late White and Mountain Rose all bore good crops of fine fruit. The Late Crawford produced moderately, but the quality was the best. The Early Crawford was a failure or nearly so. The Globe seems to be a failure with him. The much-lauded Wonderful is not as good as a Smock, which it resembles.

The peach crop was no better in New Jersey than in this State. M. M. Walker, of Germantown, Pa., who is a member of this association, is the owner of an orchard of fifty acres at Ancora, N. J. He had no fruit scarcely; not three baskets on the whole 5,300 trees. He sold one basket for \$1.00.

The Globe peach did very well in Berks county, where it originated. It was about the only home-raised variety sold in the city of Reading, and choice baskets readily brought \$3.00. A few baskets of fancy Globe peaches were sold by a Reading dealer at \$5.00 each.

Plums.

The plum continues to be a very uncertain fruit. The crops are usually so unsatisfactory that but little attention is devoted to raising plums for market, yet no fruit is in greater demand for preserving purposes. California and the other Pacific coast States are apparently monopolizing the plum and prune industry in the United States. The curculio is the most prolific cause of failure in the eastern States. On the experimental grounds of the Pennsylvania State College in Centre county, out of twenty-two varieties grown, only two matured fruit enough to notice—the Purple Damson and German Prune. Of other varieties the majority of correspondents regarded the Lombard, Richland and Yellow Gage with greatest favor. A. C. Sisson, of Lackawanna county, was one of the few to report a full crop of choice plums. He puts down the Lombard and German Prune as the best

paying varieties and sure croppers. H. W. Northup, of the same county, reported that many of his trees bore heavily. Daniel D. Herr, and J. G. Rush, of Lancaster county, prefer the Japans. O. P. Shaver, of Somerset county, had a full crop of plums of good quality. He sprayed his trees with London Purple, and had very few hurt by the curculio. Pressly Leach, of Washington county, reports a large crop and good. These were about the only favorable reports received.

Quinces.

This fruit is receiving greater attention, but not what it deserves. More trees are being planted, and if spraying is systematically observed, good results may be expected. The crop of quinces last season was the largest in some years, but the quality was mostly poor. Many trees were allowed to overbear, and the fruit was small. Your chairman saw the finest quinces in a drive through the southern portion of Schuylkill county where not much attention is given to fruit growing. It was in the latter part of September, when the trees were resplendant with golden glory. It is a rare thing to see quince trees so heavily laden with perfect fruit. The Champion and Orange are varieties which did well this year. Good prices were realized, making it a profitable fruit to raise.

Cherries.

There was only a moderate yield of cherries. The early varieties did best. Some counties reported nearly a total failure, as for instance, Adams, Allegheny, Armstrong, Bedford, Bradford, Bucks, Clinton, Crawford, Juniata, Lackawanna, Lawrence, Lebanon, Lycoming, Mercer, Mifflin, Monroe, Northampton, Perry, Pike, Snyder, Sullivan, Susquehanna, Venango, Warren, Wayne, Westmoreland, Wyoming and York. The prospects for a good crop of cherries in Berks county were very fair, but a succession of excessive rains destroyed the main part of the crop. The best varieties were the Early Richmond, Governor Wood, Black Tartarian, English Morello and Late Duke. In Bradford county the buds of some varieties were winter-killed. The English Morello, usually a good yielder in that section of the State, was almost a failure. There was a fair crop of cherries in Centre county. The Black Tartarian was fair in yield and fruit. The Napoleon Bigarreau bore heavily, but the fruit rotted badly. There was a medium crop of cherries in some parts of Chester county, but on account of rainy weather about the time of ripening they had to be picked before scarcely ripe in order to save them. They sold well. In Cumberland and Dauphin counties the cherry crop was medium. Our venerable and observant friend, Casper Hiller, of Lancaster county, is of the opinion that cherries are becoming more precarious every year. The foliage is not quite as healthy as it used to be. High ground and western slopes are best adapted to this fruit. He regards the Early Purple Guigne as his most valuable variety, but the cedar birds have an unusual preference for this showy fruit, and it is a constant contest between him and the birds for the possession of the crop.

Grapes.

The rather fair grape crop was a redeeming feature of the season of 1892. It was much better in quantity and quality than that of the previous year. In some counties the crop was all that could have been desired. The summer was favorable to the maturing of the crop. The Concord succeeded everywhere, as usual. The Clinton proved the most profitable for wine. The Niagara, Moore's Early and Worden did well. Of the newer sorts, Geneva appeared to be the most satisfactory. Eaton also showed up well. Liberal fertilization and proper pruning are bringing good returns. Rose bugs, black rot and mildew were the principal enemies with which growers had to contend. Bagging was necessary to ensure perfect bunches. It added from 20 to 75 per cent. in quantity and greatly improved the quality. For instance, in the Lancaster markets, bagged Concords sold for 25 cents a half peck, while unbagged ones commanded but 10 to 12 cents. Niagara, it seems, can only be successfully raised by being bagged. Moore's Early does fairly well without bagging. It is a treasure. The Brighton was very fine this year when bagged early. The Woodruff Red, condemned by some on account of its foxiness, is worthy of planting. The fruit is beautiful and good enough to eat. W. B. K. Johnson, of Allentown, had the best crop of grapes in five years. He applied the root treatment for fungi. Where this treatment was not given, black rot destroyed most of the grapes unless they had been bagged.

Small Fruits.

A drought occurring in June caused a shrinkage in small fruits; otherwise the crop would have been very large. Strawberries were not more than half a crop, while there was a fair yield of raspberries and blackberries. Currants did better than in some years. As to strawberries, the crop ripened almost at once, and for a few days the markets were glutted, so that prices were unremunerative. The Sharpless, usually the standard variety with most growers, was nearly a failure owing to cold and wet weather in blooming time. The Bubach No. 5, held its own as a profitable market variety, its size and rich appearance making it very salable, but in quality it does not begin to compare with the Sharpless, Cumberland, Jessie and some other kinds. The Jessie has proved a prolific variety in most localities. Michel's Early has given good results. The Crescent is a great yielder, but too small and too sour to make it popular with the consumer. There are good reports in regard to Greenville, Shuster's Gem and Van Deman from the Pennsylvania State College experimental grounds. Our treasurer, J. Hibberd Bartram, has found the Sharpless very good in some seasons, and in others very poor. He considers the Mt. Vernon and Crescent among the best. He has tried many new varieties, and is emphatic in the declaration that he is almost ready to go back to the Albany Seedling. A. C. Sisson, of Lackawanna, who has a splendid market for small fruits in the city of Scranton, speaks highly of the Parker Earle, Eureka, Warfield and Bubach No. 5 varieties of strawberries. In black cap raspberries he prefers the Hilborn and Johnson's Sweet, while in currants he regards the Fay and Versailles as the best. H. W. Northup, who supplies the same market,

grows mostly raspberries. He recommends the Palmer for early and the Gregg and Nemaha for late. Of the red varieties most growers give the Cuthbert the preference. Vice President Henry M. Engle's preferences, after testing many varieties, is the Sharpless among strawberries, Hansell among raspberries, and Snyder and Erie among blackberries. Ex-President Henry C. Snively, of Lebanon county, who is a large grower of small fruits, but especially of raspberries, supplying a number of markets, says that the Cuthbert and Ohio are his standbys in raspberries. The Haverland and Bubach strawberries are doing well with him. P. Sutton, of Luzerne, who supplies the Wilkesbarre markets, recommends the Great Pacific and Parker Earle strawberries. In his experience, the season was too unfavorable, (too dry), to say anything about the new raspberries and blackberries. O. P. Shaver, of Somerset county, has tested a number of new varieties of strawberries. The Governor Hoard is his favorite staminate variety, and of pistillates he prefers the Bubach and Haverland. As to the latter he says: "It is the berry." Dr. G. G. Groff, of Union county, an authority on small fruits, says the Palmer raspberry promises to take the place of the Souhegan. He is pleased with the Golden Queen raspberry. E. E. Avery, of Wayne county, reports a seedling strawberry which he originated, and claims that it is the best he has ever grown. Prof. S. B. Heiges, of York, the popular institute lecturer, gives as his favorites the Bubach and Jessie strawberries, Ohio raspberry and Erie blackberry.

E. C. Brinser, of Dauphin, one of the most successful growers of small fruits in the State, who supplies a number of cities, towns and villages, has furnished your chairman with a short special report on strawberries. He says: "Some varieties of strawberries, such as Cumberland, May King and Bubach did fairly well where a good stand had been secured the previous season. Sharpless, at an early location, did fairly well, but on later ground were nearly lost owing to too much cold and wet weather in blooming time. Tried Haverland, but the quality is too poor to suit me. I think I must drop Gandy's Prize from the list. Although a good late berry it is not productive enough. I have now a new berry called Greenville which promises well. As to raspberries, they never behave alike each year. While Souhegan, Cromwell, Hillborn, Ohio and Cuthbert went through all right, the Gregg, Nemaha and Shaffer's Colossal suffered from "winter-kill" or some other cause. Shaffer's, however, rallied and bore a fair crop of good fruit, but Gregg did not make more than half a crop. All the blackberries did well, but failed to make as many bushels per acre as in 1891, owing to the fruit not being as large. The quality was very good. The prices of all fruit ruled higher than in the previous season. Had one-half a crop of currants, but the quality was fair. Would favor the Red Cherry and Fay for planting."

Vegetables.

The early part of the season of 1892 was favorable to the growth of vegetables, but the latter part was decidedly unfavorable owing to drought. In consequence of dry weather during the greater part of July and August the late crop of potatoes was a comparative failure. In those well-known potato districts in the slate and gravel

soils of northern Berks, Lehigh and Northampton counties, largely supplying the markets of Philadelphia, New York, Reading, Allentown, Easton and other cities, there was less than half a crop of potatoes. Prices advanced rapidly until they reached 90 cents early in December, \$1.10 at the beginning of 1893, and have just gone up another peg to \$1.25 per bushel. A number of farmers who were holding their crops for higher prices sustained heavy losses through the potatoes freezing in the cellars during the present extremely cold weather. One farmer in Albany township, Berks county, had 2,000 bushels of potatoes on hand, another 1,200, and half a dozen a thousand bushels each.

There was a large cabbage crop, but there was much loss caused by rot. The same may be said in regard to celery. There was a good yield of tomatoes. Cucumbers and squashes suffered greatly from insects. The onion crop was a good one. Carrots and beets did well considering the dry season. More attention is being given this department from year to year, but still it does not receive that attention which its importance deserves. In the vicinity of large cities fine truck gardens are usually found, but farmers' gardens as a rule show much neglect. The reports of your chairman's correspondents agree in this particular. As to some of the newer things in vegetables, R. M. Welles, of Bradford county, is highly pleased with Giant Pascal celery. He raised melons in abundance. The vines fruited earlier, but the later melons did not ripen. He grew that fine little melon, Emerald Gem, with success. James W. Gaul, and Solomon Shearer, of Vinemont; John R. Blankenbiller, of Angelica, and Aug. L. Wentzel, of Lower Alsace, supplied the markets of the city of Reading with watermelons and cantaloupes. The latter were of finer flavor and more luscious than those brought from New Jersey. They realized at the rate of about \$600 per acre. Mr. Blankenbiller had great success also with his celery crop, having averaged \$600 per acre.

Shrubbery, Plants and Flowers.

All the reports received indicate gratifying progress in the inculcation of a love for the beautiful, as manifested in a desire to make the surroundings of home more attractive. It is hardly necessary to quote from the language of correspondents as to the tendency of the times in this respect, all agreeing that the improvement is substantial and encouraging. In some sections the people are not displaying the interest they should, but they are awakening gradually to the fact that a judicious expenditure of a little money for shrubbery, plants and flowers, adds to the value of the homestead and the beautiful acquisitions exert a refining and elevating influence. Attention has been called in former reports of your committee to the beneficent results of the observance of Arbor days, the annual horticultural displays and dazzling chrysanthemum shows in the principal towns and cities. The love for flowers has actually proclaimed itself in the halls of our National Legislature, a member of Congress of aesthetic taste having quite recently offered a bill to adopt a new design for the American flag. Unfortunately, he seeks to adorn it with a flower—a Pansy—which has not been adopted as the national emblem. Wherever a vote has been taken upon the question, the Golden Rod,

which waves its shining plume from the Atlantic to the Pacific, has had an overwhelming preference. "Only a Pansy Blossom" may be a fitting title for a sentimental song, but it is not the emblem which should adorn the flag of the greatest nation on the face of the earth.

As to varieties of shrubs, the old and well-tried hardy sorts continue to be the most popular. There have not been any desirable acquisitions in recent years that have not been noticed in these reports. On the experimental grounds of the Pennsylvania State College, in Centre county, the horticulturist in charge, Prof. George C. Butz, is doing a good work in adding new shrubs and plants every year to the list of ornamentals. The handsome appearance of the college grounds, comparing favorably with any college campus in the land, is exerting a noticeable influence upon the citizens of the surrounding country. In fact, the campus is becoming noted for the opportunities for intellectual improvement in the direction of the study of horticultural novelties which it affords the intelligent visitor to the grounds. *Actinidia polygama*, a Japanese climber, has proven hardy there. So is *Clerodendron seratina*. A large number of new garden varieties of evergreens were added to the collection last year for the purpose of testing their hardiness in Pennsylvania, and their adaptability to our soil and climate. The extreme beauty of these novelties will recommend them wherever they can be grown. The questions to be answered by these trials are: "Are they hardy, and will they retain all their good traits when grown in this climate?" In this connection I desire to call attention to the good work that is being accomplished by the agricultural experiment stations throughout the United States. The bulletins of these stations, as published monthly, are invaluable. No appropriations by Congress are more judicious than the amounts contributed for the maintenance of these stations. At the Pennsylvania State College a course of home readings in agriculture and horticulture has been established which must prove highly beneficial.

General Observations.

In view of the severe weather now being experienced, the theory that our climate has changed and that the winters are growing milder will not hold good. We are certainly having what is usually called an old-fashioned winter. The temperature has ranged below zero every morning this week, and on last Monday morning, January 16th, there were several places in the State where 36 degrees below zero was reported, the lowest marking in half a century. Mount Pocono, Monroe county, reported 36 degrees below, and Bear Gap, near Shamokin, reported 24 degrees below zero. This morning in Reading the temperature was down to 8 degrees, below zero. Geigertown reported 16 below and Douglassville 20 degrees below zero. What effect this cold weather may have upon the fruit crop of 1893 remains to be seen. The thick mantle of snow which covers the earth will no doubt prove a sufficient protection to the trees, and will also retard the sap, so that there need be no apprehension that the fruit trees will bloom prematurely, and the blossoms be nipped by the frost. The Delaware peach growers have already given up hope. A dispatch from Milford, Del., the centre of the fruit belt of the little peninsular State, dated January 16, says: "Most of the fruit growers have this morning given up

this year's crop for lost, as the temperature was 4 degrees below zero, and is still dropping."

There were a great many inquiries during 1892 for copies of the Peach Yellows law, approved by the Governor May 26, 1891. Several times your chairman exhausted his supply, but obtained additional copies from our librarian, Thos. J. Edge, the able secretary of the State Board of Agriculture. A number of correspondents were unaware of the existence of such a law. They were asked the following question: "What steps, if any, have been taken in your section of the State for the enforcement of the Peach Yellows law." The majority of the replies were to the effect that nothing had been done. Some wrote that they had fulfilled the requirements of the law themselves, but could not compel their neighbors to do so. It is to be hoped that greater attention may be given this subject, as already referred to in the report under the head of "Peaches." S. Edward Paschall, of Doylestown, editor of the "Bucks County Intelligencer," in acknowledging the receipt of a copy of the law, wrote: "Please accept my thanks for copy of act of Assembly referring to Peach Yellows. I have made editorial reference to it. It seems to me that the act should have included black knot on cherry and plum trees, as I suppose black knot to be contagious. I have worked faithfully against black knot, with both knife and Bordeaux mixture, and seem to have it under control." The laws of Delaware, Maryland and Virginia relating to Peach Yellows, each contain sections relating to the stamping out of black knot of cherries and plums. Similar provision would have been made in the Pennsylvania act, but the section was omitted at the suggestion of members of the Legislature who were afraid the law would not go through. As it was, hard work was necessary to secure its passage and it was amended in several important details, the one of the greatest moment being the reduction of the penalty, both as to the amount of the fine and the number of days of imprisonment.

The peach borer causes a disease nearly akin to "Yellows" in appearance. Trees thus attacked must also be looked after if healthy trees are expected. When the presence of "Yellows" is suspected, or the tree exhibits signs of unhealthiness, it would be well to try an application of kainit, or crude sulphate of potash, in connection with ground bone and a small proportion of sulphate of ammonia or nitrate of soda. As potash is an important remedy in the restoration of unhealthy trees, unleached hard wood ashes may also be used with good results. The sulphate of potash not only supplies an ingredient needed by the soil, but also an antidote to disease by its chemical action. The employment of stable manure is undesirable, as fermentation can answer no good purpose.

Frederick Jaekel, an esteemed correspondent, of Blair county, and member of the general fruit committee, in attending the Franklin County Farmers' Institute, at Greencastle, last June, was shown a limb of a peach tree afflicted with the so-called "curling disease." He requested time to investigate the disease, and the result of his observations was published in the Greencastle "Press" of the 8th of December last, as follows:

"Curling Disease can be noticed on the peach tree by a blister-like swelling and curling of the leaves. It is caused by a fungus, feeding on many plants, and named *exoascus deformans*. It penetrates the

openings of the leaf cells, and causes deformation of the leaf, whereby a drawing together and curling of the diseased part of the leaf is brought about.

"The cause of this disease is principally due to abrupt changes in the temperature, and the dusting of diseased trees with flour of sulphur has brought about the best results. This fungus is quickly disseminated, and at the first notice of a sick tree the cure should begin. The best instrument to bring the sulphur in contact with the leaves is a common bellows and a box containing the sulphur. I have bought such a bellows for the purpose of handling my trees, but if the thing would be a little enlarged it would answer very well. The best time to do this work is during dry, warm weather. If this disease is watched it may be eradicated in a very short time, and so effectually that the other branches on the diseased tree are never touched by it."

Another question put to correspondents by your chairman was the following: "What progress has been made in your neighborhood in the spraying of fruit trees and the use of fungicides and insecticides?" The replies showed that in many sections of the State no attention whatever is given to spraying. In other places spraying has been observed with splendid success, and has resulted in a great awakening in this respect. As an example of what can be done W. B. K. Johnson, of Allentown, writes: "I used a sprayer in my nursery, also in my pear and quince orchards, with best results for scab, codling moth, &c. Also used the sprayer on my peach trees and obtained fine fruit. The demand is rapidly increasing for sprayers."

There are others who do not regard the spraying machine with as much favor. E. P. Swift, of Allegheny county, says that after nearly destroying many of his trees he discontinued the whole business.

Casper Hiller, of Lancaster county, writes characteristically, as follows: "It is attended with difficulties; it is expensive and is not always a success. The machine manufacturers in their picture advertisements have their men dressed in their Sunday clothes, when, in fact, work as you will, it is a dirty job. The air will blow the spray at times over you, and you will be plastered all over with the poisonous stuff. You will have to protect yourself with a gum suit and a sponge in your mouth. Work in a gum suit when the thermometer indicates 90 degrees. Whew! Better do without grapes. But we are only in the beginning of this work, and we have reason to think that these difficulties will be overcome."

Several new varieties of apples and pears, apparently of much merit, came to your chairman's attention in 1892. A. C. Sisson, of Lackawanna county, sent to him two specimens of a beautiful apple, which has been given the name of Clark, after the owner of the farm where it originated. This fruit was noticed by your chairman in the columns of the "Reading Eagle," and thus described: "It is an early winter variety. The fruit is large to medium in size, oblate, thin skinned, with short, stout stem inserted in a moderate cavity; calyx closed set in a wide basin. The color is greenish yellow, almost golden yellow when fully ripe, splashed and dotted with carmine, with a reddish blush. The flesh is melting, of sub-acid flavor. The core is small, containing slight, light brown seeds. The tree is described as vigorous and hardy, its weak point being liability to overbear and break down while young. The fruit should be thinned out. The

Clark evidently fills an important place as a late fall and early winter sort."

Prof. George C. Butz, the horticulturist of the Pennsylvania State College writes: "I wish to notice here an apple named Lehigh Greening, of which a fine specimen was sent to me by W. B. K. Johnson, of Allentown, on April 13. It weighed 10 5-8 ounces, was very large, skin yellow, spotted with small gray scars and a few large dark brown spots, rusty in stem cavity, flesh (plump at this date—April 13), yellowish, white, crisp, sub-acid, less so than Rhode Island Greening, somewhat juicy core, small apple, fair for eating and likely good for cooking. Its season is claimed to be from January to June."

In regard to the Lawson pear, Prof. Butz says: "The Lawson ripens in the first week in August with a rich, bright crimson cheek in the sun. A further test is necessary to draw conclusions. A great merit lies in the fact that it is seedless."

Some sections of the State were visited in the beginning of July by a destructive hail storm which caused great loss to fruit growers. This was especially the case in a belt of Lebanon county. Your chairman spent an hour on the 4th of July on the fruit farm of Henry C. Snively, in Lebanon county, three miles northwest of the city of Lebanon, and had an opportunity of seeing for himself the ruin wrought by hail. His grape crop was ruined and black cap raspberries badly injured. In regard to the Crawford county storm, James Turner, of Meadville, writes that owing to the great destruction by a hail storm in June they had no apples at all, only half a crop of pears of poor quality, no peaches, plums or cherries, very few quinces, half a crop of Concord grapes, and a very poor crop of small fruits.

From many portions of the State came reports that English sparrows were less numerous than in former seasons. This was no doubt due to the bounty placed upon them. This gave an incentive to hunt them, and where this was done persistently they soon left for more congenial quarters. We have observed that there are still plenty of sparrows around in the present cold weather. Death-dealing ice storms seem to have no terrors for them. The question of food is the main one for the sparrow; if he gets enough of that he is not troubled with cold feet.

Apples made a rapid advance in price during the fall. Early in the season they could be bought at \$1.25 to \$1.75 per barrel. Seven weeks later they commanded \$3 to \$3.50. Wholesale dealers reported fine fruit scarce, and that most of that in the market was only medium. The entire product also got into the hands of a few speculators, who cornered the market. There are, therefore, apple trusts as well as the gigantic monopolies in other branches of trade. A Reading gentleman, who made a trip through western New York and Canada, for the purpose of purchasing a large quantity of apples for the Reading Cold Storage Company, found that the apples then in the market were at least fifty cents higher than they would bring in Reading. He visited a cold storage building at Niagara Falls, where 30,000 barrels were stored, but \$3.50 a barrel was asked, and they would cost \$3.75 delivered in Reading.

Potatoes have taken a big jump. Owing to a short crop they started at a high figure last fall, and have been steadily advancing. The prices in eastern Pennsylvania in the latter part of September-

were 65 to 80 cents a bushel. At the same time in 1891 they brought 30 and 35 cents a bushel. Since last fall potatoes have gone up to \$1.25 per bushel, at which price choice lots are now retailing in Reading. Owing to the cold weather they cannot be safely handled. Potatoes were bought up last fall in Scotland and Ireland for shipment to America. The north of Ireland contributed large quantities of potatoes for sale in the markets of the United States. This is like carrying coals to New Castle.

Joel V. Garrettson, of Adams county, reports having realized more money from his apple crop of 1892 than from his very large crop of 1891.

Joseph F. Moore, of Berks, reported the destruction of his cabbage crop by a green worm. Remedies that were efficacious in other years failed to have any effect.

D. M. Seyler, of Berks, obtained the following prices from Reading dealers for some of his products: Strawberries (Sharpless) 25 cents per quart; peaches (Globe), \$2.00 per basket; potatoes, \$1.25 per bushel.

Oliver D. Schock, of Berks, writes: "Fungus growth defoliated grape vines and the Bordeaux mixture was the most effective remedy. A weak solution of paris green as an insecticide upon plum trees also succeeded remarkably well. Where it is applied too strong it will effect the foliage, doing serious injury. Without perfect and healthy foliage there can be no perfect and healthy fruit."

Milton T. Donmoyer, of Berks, writes: "I had a heavy crop of grapes, but found very few perfect bunches unless bagged."

R. M. Welles, of Bradford, remarks: "The apple moth, curculio and other fruit insects, having fewer fruits to operate upon, showed larger average damaging work. The potato blight lessened promising crops."

President William H. Moon, of Bucks, writes: "We think the year just past has been very productive of injurious insects."

J. W. Pyle, of Chester, gives his apple orchard an annual top dressing of bone phosphate or barnyard manure, and has a good crop every year.

Our treasurer, J. Hibberd Bartram, of Chester, kept his pear trees cut back so they could not over-bear and had fine fruit. Seckel and Kieffer did remarkably well. The latter brought 40 cents per half peck this winter. He had a good crop of chestnuts which brought good prices.

Joel A. Herr, of Clinton, says: "The large crop of apples and plums of 1891 served to propagate insects enough to greatly damage the crop of 1892."

E. C. Brinser, of Dauphin, says in regard to grapes: "My grape crop was not as satisfactory as I wished, owing to considerable rot. By spraying my vineyard twice with Bordeaux mixture, I held a fine foliage on most varieties, but it did not prevent rot. Perhaps my spraying was not persistent enough. However, I succeeded in getting some fine Concord, Moore's Early, Worden, Cottage, Eaton, Jewell, Telegraph and Niagara (when bagged). One three-year-old Daisy had some beautiful bunches of good fruit."

Hon. Noah Seanor, of Indiana county, writes: "In the fore part of last summer the weather was entirely too wet; then later in the sea-

son the drought set in. I think this was largely the cause of our shortage in fruit."

J. E. Jamison, of Juniata, reports: "More clear money was made out of fruits this season than for many years. Prices were fairly good."

Joseph T. Smith, of Juniata, writes: "Peach Yellows is gaining a strong hold in orchards that are not well cared for. Such who take diseased trees out promptly have had no trouble in keeping the disease under subjection. I think the yellows' law should be enforced."

H. W. Northup, of Lackawanna, writes: "When the season permits (that is when it doesn't rain all the time) I attribute my success in growing fruit to the spraying of my trees and vines."

A. C. Sisson, of the same county, says: "One thing is certain, if there is any money to be made in raising fruit, there must be more intelligent care and untiring efforts to produce none but the very best quality, and it must be put on the market in the most attractive shape. There is too much competition in common fruit to make it remunerative. The craze to get new varieties is expensive and often unsatisfactory. As a rule stick to those you know are good and adapted to your locality. Insects must be fought with persistent perseverance; also the whole list of diseases. Trees and plants must be fed and nourished. Upon these depend the success of the fruit grower. If he does not feel equal to the task, he had better quit the business, but there is a brilliant future for all who have pluck, backbone and brains."

Henry M. Engle, of Lancaster county, says: "More attention is given to horticulture generally each successive season, and the demand for horticultural products is increasing correspondingly. It is gratifying that such is the case, since general farming does not pay as in days of yore. Farmers are slowly learning that intensive more than extensive cultivation of the soil is to be the watchword; that there is no necessity for the scrambling for more broad acres. The consequence is, more and better fruits and vegetables will be consumed by the producers themselves, which has been so much neglected by the great majority of cultivators of the soil. Greater happiness and better health will necessarily follow."

Henry C. Snively, of Lebanon, writes: "The peach buds were frozen last winter and the peaches, of course, were few and far between. The Golden Rareripec and Stump gave me about all I had. The former I regard as the most reliable peach of all the varieties on my place. A Rareripec will fruit when all others fail. The Globe is disappointing to me. It seems to be no more productive than the Susquehanna."

P. Sutton, of Luzerne, reports: "The drouth hurt some of our crops badly. I have quite a number of the newer varieties of strawberries, raspberries, and some of the blackberries, but owing to the drouth, I cannot say much about them."

Henry Ort, of Mifflin county, writes: "In speaking of that dreaded disease, Peach Yellows, I would not dare enter a yard or orchard and command an affected tree to be removed. While I use every precaution to prevent the disease, a neighbor, with only a wire fence between, can keep disease in one old tree sufficient to set years of toil full of 'yellows.'" Mr. Ort has great faith in spraying. He uses the Bordeaux mixture on every tree.

R. F. Schwarz, of Monroe county, says: "I have thirty new varie-

ties of strawberries planted, but cannot as yet give results. The season was, all in all, favorable, but the winter-killing of raspberries was a puzzle. The oldest plants were the worst affected, and so down to yearlings which suffered the least."

John P. Fredd, of Montgomery, obtained twelve baskets of peaches from his orchard of seven acres. The cause was the previous mild winter, which allowed the fruit buds to start too early, and then they were killed by late frosts in the spring. The standard varieties of peaches are the Crawfords, Mountain Rose and Old Mixon. Ford's Late is an excellent fruit.

Judge Edgar Pinchot, of Pike, says: "The season was peculiar. The great humidity was favorable to the production of the enemies to cherries. All sweet varieties were destroyed by them."

E. O. Austin, of Potter county, reports: "The fore part of 1892 was wet, cold and late. The very earliest blooming fruit trees set well and produced an excellent crop. Then followed many days of cold, wet weather and few sets were made of the later flowering trees. Then brighter weather allowed belated blossoms to set their fruit pretty well. I notice bees did not do very well, as it was too cold and wet in their busy season."

O. P. Shaner, of Somerset, had fourteen varieties of strawberries on a half-acre plot, from which he sold 65 bushels. Haviland gave the largest yield. Crescent came next and then Crimson Cluster. Rust affected most varieties to some extent, Barton's Eclipse worse than any other. Haviland escaped almost entirely. Governor Hoard came out unhurt. Saunders nearly as well, but fruit is too much cox-combed. Sharpless did the poorest of all. His soil is a heavy clay.

Dr. G. G. Groff, of Union county, writes: "The high prices paid by buyers for apples and peaches, and especially two large apple crops in succession, has turned our people toward fruit growing, and I expect much more planting in the future. I think there is no reason at all why this, the Buffalo valley, should not become known for both apples and peaches. I am experimenting in a small way; have 2,000 peach trees and several hundred apple trees, with small numbers of all the other fruits which will ripen here. As far as I am able I propose to plant for commercial purposes."

Theodore Day, of Wayne county, in speaking of insects and diseases, says: "The round head borers are checked by clearing around the trees so that the birds can get at them, and cutting out what is found once or twice each year. Should be looked for three times. Black knots, where not too abundant, can be cut or broken out, and should be attended to three or more times each summer. I think it would be best to destroy the whole tree, where they are very abundant; and the same with pear blight. When the leaves first appear spotted, if dry, unleached wood ashes are dusted on the trees freely, while damp, no blight occurs."

Prof. S. B. Heiges, of York, reports: "Individually, the year has been one of abundant fruits of all kinds. I am trying about twenty new varieties of strawberries, upon which I hope to be able to report next year. Of grapes I have now about thirty varieties. Vines sufficiently old bore very well. Pears were so abundant that we could scarcely use all, and were of excellent quality. Of twenty varieties of apples I had a very fine crop. My bins are well filled with finely-

grown specimens, the result of spraying. My peaches were frozen in the bud. Vegetables were very fine excepting late celery and cabbage, which were stunted by a long-continued drouth."

The above are the leading general observations as obtained from the reports received by your chairman. They contain much material for discussion, and are the results of the practical experience of the most prominent fruit growers and horticulturists in the State. A correspondent, who for a number of years assisted your chairman in furnishing him with valuable information, died during the past year—Levi S. Reist, of Lancaster county. Your chairman's acquaintance with Mr. Reist extended over a period of some twenty years. He was a large farmer and a progressive horticulturist, a valuable member of this association.

In conclusion, I would return thanks to all who so kindly favored me with the result of their pomological and horticultural experiences in 1892.

Respectfully submitted,

CYRUS T. FOX,

Chairman General Fruit Committee.

Reading, Pa., January 18, 1893.

On motion of Mr. Cooper, report was accepted and a vote of thanks tendered.

Mr. Meehan. It has been customary heretofore to discuss this report, have members and others ask questions, and add anything in the line of their personal experience and observation. The report read is an able epitome of the year's work, and while much has been brought forward to show our progress, there are several points that seem to have been overlooked. In the first place, all the correspondents say, in reference to Peach Yellows, that nothing has been learned, and one states that the only thing that is known is that the disease is contagious.

It has been proven that trees can become diseased by inoculation, and facts have been deduced to show that even with every chance for infection the disease has not developed in California. Though highly contagious, it is certain there are some limits where it will not spread. There are some sections in the South where "yellows" do not exist, and the question arises why it should be limited to certain sections. Facts teach us something, and it is unquestionable to my mind that the disease begins at the roots, and that it will not develop in California or in the Southern States. It is a fungus disease, some species of which develop only in dead and decayed wood and are never found elsewhere. Where this particular fungus exists you will find "yellows," and the disease can be produced by half rotten wood left lying around or near peach trees, provided the spores of the fungus first find the rotten wood to get a start with. To my mind we have advanced in our knowledge of peach "yellows," and I believe we will eventually be able to prevent it.

Another point is in reference to temperature and its influence on trees. In Delaware a moderately low temperature will destroy peach buds. Farther north, where trees are more vigorous and healthy, there is less tendency to bud destruction. In Canada, when affected by cold, much depends on the health and consequent resisting power of the trees. When sound and in good vitality they will stand much

more cold. There is not so much danger from low temperature in January as in February.

Some correspondents are doubtful about the effects of spraying. It is only in recent years that we have learned the benefits that are derived therefrom. Since we have used sulphate of copper and the sprayer we have gained considerable in the prevention of fungus diseases. There is no better illustration of this than is shown by spraying and bagging grapes—spraying destroying fungus spores and bagging preventing spores from reaching the fruit. Perhaps the virtue in spraying may not be altogether due to the copper. Probably more is owing to the sulphur which is the deadly enemy of all kinds of fungus. One reason why fruit growing is successful in cities is owing to smoke, which contains sufficient sulphur to counteract the vigorous growth of fungus, and to insure healthy foliage. Peach trees always bear in Philadelphia, and pear trees are healthy and sound for the same reason.

These were points that it occurred to me would be profitable to discuss further, and I have thrown out these hints in the hope that they will have further consideration at your hands.

Mr. Herr. On August 18th last, Mr. Kready and myself visited the peach orchards of Hale Bros., in Connecticut. They consist of about 100 acres, part of which is 14 years old, and they seem as vigorous and healthy as though the trees had come from the nursery last year. They use no barnyard manure, but apply every year 600 pounds of potash and 1,200 pounds of bone dust per acre, and cultivate until July. When we were there the trees were loaded with fruit. Mr. Hale claims that potash prevents "yellows," and we saw but two trees in his orchard that showed any symptoms of the disease.

Mr. Hale wrote me later that his crop was 16,000 baskets, from which he realized \$22,000.

Mr. Jamison. I have been styled in Juniata county a crank on the subject of peach "yellows." I have always claimed that if proper attention were given at the start, there would be but little trouble. Infected trees usually bloom from one to three days earlier than healthy ones, and have more and larger buds. Several years ago I noticed a particular line or streak of trees in my orchard that showed signs of "yellows." Upon investigation, I found that a man living on a line with my orchard, had a number of infected trees and also a colony of bees. I induced him to remove his trees, and after that found no further development of "yellows."

I am told that an effort will be made to repeal the "yellows" law that was enacted two years ago, and I hope every member will use his influence to prevent its repeal. The purpose of the law is a good one, and no peach grower can fail to be benefited by having it enforced. In regard to the profits of Mr. Hale, as reported by Mr. Herr, I might add that we have done as well in Juniata county, where an orchard of 510 trees, five years old, netted \$1,170.00.

Mr. Brinser. While it is a fact that "yellows" is contagious, is it not possible to cure or prevent its spreading except by destroying the trees? Is there no known means or remedy by which we can prevent our trees from becoming infected? My orchard, five years old, shows no indications of the disease. Mr. Snively and I walked through the orchard last season and were surprised to find no sign. Whether

owing to soil or location am not able to say, but I am inclined to the opinion that overproduction and consequent weakness and loss of vitality in peach trees are liable to induce "yellows." I think that by applying bone and avoiding overproduction I will be able to save my trees for a while at least.

Mr. Herr. Mr. Hale will not allow his trees to overbear.

Mr. Cooper. I would advise Mr. Brinser and others not to be in too great hurry to destroy peach trees that show signs of "yellows."

I had some infected trees two years ago, on four of which I tried an experiment that has thus far been successful. Am not yet ready to say what I used, as I wish to extend the experiment another season. One tree that had no treatment died. I want one year more, and if successful I think I will give it to the society at next meeting.

Mr. Moon. Along the Delaware valley "yellows" have thus far made but little headway.

Mr. Engle. I have heard of "yellows" being cured and have heard others assert that the disease is incurable. One thing seems certain, if the disease can be cured, it can in great measure be prevented. I have made some experiments by top-budding peach on plum, taking peach buds from trees infected with "yellows." My experiments proved that while the disease can be transmitted, it does not readily develop when top worked on plum trees. I have now a peach orchard of a few hundred trees on Blackman plum, hoping by this means to prevent "yellows." The orchard has now borne several crops, and though a few are diseased, they are much less liable to take it than those on peach roots.

As to the "yellows" law, I think that if it were amended so that the examination and condemnation of trees were placed in the hands of scientific men, it would be more effective.

Mr. Fox. The law simply authorizes the supervisors of the different townships to appoint three commissioners, whose duty it shall be to examine trees and order them removed.

Mr. Brinton. We all seem to have our own theories as to "yellows." In my opinion, the disease is more climatic than anything else. Some seasons the disease is more destructive than others. Instances are known where trees apparently affected by "yellows" have recovered and borne crops afterward.

Mr. Stout. The law referred to is similar to the act in reference to Canada thistles. No one cares to inform on their neighbors, and it will likely remain a dead letter.

Mr. Fox. The act in reference to Canada thistles does not require supervisors to appoint commissioners. The "yellows" law can be enforced, and where organizations exist that are interested in peach culture, there will be an effort made to enforce it.

The Secretary. I regret to say that in Franklin county, where I reside, the "yellows" law is not being enforced as the great peach growing interests should demand for their own preservation.

In the first place, that feature of the law which vested the appointment of "commissioners" in the supervisors of townships, was objectionable to many of our leading growers, and an effort was made to have the law amended so as to have commissioners appointed by the courts, upon the recommendation of the local horticultural societies or committees of the representative growers. In the next place, we

experienced considerable difficulty in getting suitable persons to act as commissioners. It requires some experience and practical knowledge of "yellows" to decide which trees are infected and which are not, and where growers were themselves ignorant of the symptoms, or indifferent as to the injury wrought by the disease, they were reluctant to destroy trees that were condemned and marked by the commissioners. In some instances this led to disputes and threats of ejection, and as a natural consequence many of the commissioners who served the first year, refused a reappointment, and in some instances no one could be induced to accept the appointment. Thus it will be seen that the law is in a great measure disregarded and inoperative because of indifference, and those who are our largest and most successful peach growers are content to remove all trees on their own grounds that show symptoms of "yellows," and to my knowledge no active effort is being made to enforce the law.

The peach growing interests of our section are, however, rather young and are rapidly growing, and I am inclined to the opinion that in a very few years self-preservation, if no other reason, will create and sustain a sentiment that will have the law rigidly enforced.

Mr. Stout. One of the important and interesting questions referred to in report of General Fruit Committee is that of spraying. I have tried Bordeaux mixture on grapes as well as for leaf blight on pear, with most satisfactory results.

Mr. Cooper. I can also bear testimony to the value of spraying for leaf blight on pear, and have used Bordeaux mixture with very satisfactory results. I sprayed one side of a *Beurre d'Anjou* pear tree, and when the fruit was ready to pick that part of the tree which was sprayed had fine fruit and healthy foliage, while the other half was almost entirely denuded of foliage.

Mr. Engle. There is to my mind no subject of more importance to fruit growers than that of spraying. It is not only necessary for the destruction of insects but for the preservation of the foliage, which is often diseased when we scarcely notice it. When spraying we should pay as much attention to fungicides as to insecticides.

Mr. Woods. In regard to the "yellows" law, I hope it will not be repealed, but amended so as to make it more effective. I am glad we have such a law though it is not enforced as it should be.

I try to persuade people to remove infected trees as soon as they are noticed, because this is the only safe course. Have never known a tree that was seriously affected with "yellows" to recover.

ARE SPECIAL FERTILIZERS OR ANIMAL MANURES MOST ECONOMIC FOR THE FRUIT GROWER?

On motion of Mr. Brinser the aforementioned question was taken up for discussion.

The following paper by Casper Hiller, Esq., was read by the secretary:

The important plant foods for orchards as well as for grain consist of nitrogen, phosphoric acid and potash.

Magnesia, soda, silica, &c., that also enter largely into tree and plant growth, are usually so plentiful in our soils as to require little attention.

How much of these plant food elements do we want for our orchards?

As long as orchards make a luxuriant growth they want little. But the great majority of our orchards are not of that kind. They want manure.

It is not a settled question how much nitrogen is wanted. Some contend that it causes a rampant, long-jointed, late, succulent growth, which is liable to winter-kill, or leading to unfruitfulness.

In young orchards this may be so, but when you have an apple tree on which twenty bushels of apples are growing, or a peach with three bushels of fruit, you need not fret about succulent growth. Experience has shown that,

100 pounds of potash,
50 pounds of phosphoric acid,
40 pounds of nitrogen,

is a good dressing per acre for a bearing orchard, especially for one that has made large previous crops.

The cost of this in special fertilizer will be:

200 pounds muriate potash or 800 pounds Kainit, potash,	\$5 00
350 pounds acid S. C. Rock, phosphoric acid,.....	3 00
200 pounds nitrate soda, nitrogen,.....	4 00
	<hr/>
	\$12 00

What amount of stable manure is required as an equivalent?

A ton of good stable manure contains

11 pounds of potash,
4 pounds of phosphoric acid,
8 pounds of nitrogen.

As potash is the most important element in orchard manure, we should use enough stable manure to make up the amount named (100 lbs.) in the above formula. This will require nine tons of manure. This gives us a shortage in phosphoric acid and an excess of nitrogen, making it an ill-balanced manure for orchards. But if anyone has the nine tons of manure and has no place to put it where it is worth more than \$12.00, he can use it on the old orchard without serious loss from the shortage or excess.

In my county, such manure is worth \$2.50 a ton to the tobacco growers. It is worth about the same for general farm crops, if judiciously used.

Owing to this valuation, as well as to its ill-balanced condition, we can say, "stable manure is not an economical manure for orchards." The potash in the 200 pounds of muriate of potash and in the 800 pounds of Kainit is about the same in quantity and value.

Most of the extraneous matter in the Kainit is common salt. It is claimed by some that this has a value in peach orchards or vineyards to more than pay the additional cost of freight.

Mr. Meehan. This is an important question and I hope our members will give their experience. Years ago it was thought that chemistry would aid us in selecting and applying fertilizers to best advantage, but this hope has been only partially realized. It is related of an en-

thusiastic fruit grower that he thought the time would come when sufficient manure for an acre could be carried in his vest pocket.

His superintendent stated in reply that when that time came he thought the entire crop from an acre could be carried in the other vest pocket.

My own experience has convinced me that while special and concentrated fertilizers in many cases serve a good purpose, the best results are obtained from the use of barnyard manures.

We are all obliged to work for a livelihood and the same is true of the vegetable kingdom, which makes it most luxuriant and natural growth when it must itself assimilate and utilize the fertilizing elements that are applied by man. The atmosphere, too, is an important factor in vegetable growth, but unless the soil is full of air all manure is of no value. Stable manures render soils light and porous. Unless the soil contains a certain amount of air we cannot get seeds to grow. Apple seed, an inch below the surface, will not grow until the following year. The great value of stable manure is to carry into the soil those elements that are necessary for plant growth. We may plant potatoes with the richest nitrogenous manure, and they will not do as well as if simply covered with straw.

Mr. Chase. I am aware that some of our scientists and a portion of our agricultural press are inclined to recommend special fertilizers to the exclusion of barnyard manures, but my experience is that the farther we get away from barnyard manures or their equivalent, the farther we are from success. You, Mr. President, may recall visiting with me some years ago a farm in Burlington county, New Jersey, where nothing but special fertilizers had been used for many years. If so, you will recall that, although the soil was naturally good, it had been reduced to a condition of vegetable starvation by the treatment it had received. Many times have I urged this party to either use barnyard manures liberally, or plow under clover or some other crop so as to return some vegetable matter to the soil. I realize, Mr. President, that it is not always practicable for a man to secure or use barnyard manures, but where this is the case, and he is obliged to depend largely upon commercial fertilizers, I wish to impress the importance of plowing under some vegetable matter. If this is not done disappointment is sure to result.

Mr. Engle. I beg leave to differ on some points from the views advanced by Prof. Meehan and Mr. Chase. I think the time has come when we must, in a great measure, depend upon commercial fertilizers. Of late years we have been using them with a liberal hand, and when we must buy manure prefer to buy special fertilizers. As to stable manure, we can get no guaranty of its value. Some of it is worth five times as much as others, and its value depends entirely upon the material with which stock is fed, and the manner the manure is handled.

I fully agree that without some vegetable matter we cannot get best results. A work entitled "Chemicals and Clover," reports a number of instances where land was fertilized with clover and special manures with great success. My friend, Mr. Hiller, has brought up land with commercial fertilizers alone, and my own experience is that we need not depend upon stable manure, and we have ceased buying it. During the past season we raised some 800 to 1,000 bushels of potatoes with special fertilizers, and we had just as fine crops as with

stable manure. Have also grown celery, cabbage, horseradish and other market crops all very successfully with commercial fertilizers.

Mr. Herr. Mr. Hale told me that when he started peach culture his land would not pasture two cows. He has used special fertilizers exclusively for his trees and they look remarkably healthy and vigorous. He stated further that he would not, for fruit trees, take barnyard manure as a gift.

Mr. Brinser. It seems to be a settled fact with some that commercial fertilizers answer a very good purpose. Others do not think so. During the past four or five years I have bought some land that was much run down—nothing left, as it were, but the ground; but by the use of stable manure and fertilizers it has been made productive in a few years, and with me the question is not "does it pay?" as that seems settled, but how to get the best fertilizer for the least money. In potato growing I have used fertilizers with success, though I believe we generally use it too sparingly.

I find we never have scab when we use plenty of fertilizer.

I have been working to try and get up a mixture that would cost less than the commercial fertilizers in the market, and yet be more lasting in its results. I think bone is the basis of such a mixture, and I wrote to the "Armour Packing Company," of Chicago, who make special manures, and they have sent me the following formulas:

	Ammonia.	Bone Phosphate Lime.
Blood and bone, . . .	7 per cent.	30 per cent.
Raw bone,	2 to 2 1-2 per cent.	55 to 60 per cent.
Fine ground bone, . . .	3 to 3 1-2 per cent.	50 to 55 per cent.

This mixture could be delivered here in car loads at \$28.40 per ton, but it has no potash. Can have Kainit delivered at \$11.58 per ton. Taking a ton each of the above and mixing we have two tons for less than \$40.00, less than \$20.00 per ton. I wrote Mr. Frear, of State College, in reference to the mixture, and he pronounced it good for fruit trees, but for peach trees he said that sulphate of potash is better than my mixture.

A still cheaper mixture for prompt action can be made by using South Carolina rock. I have been using a fertilizer costing \$26 to \$28 per ton, the basis of which is claimed to be bone. At my place stable manure is practically out of the question when much is needed.

Mr. Stout. This seems to be more an agricultural than horticultural question, but still it is one of great importance. I have used commercial fertilizers to some extent, and I have found by experience that worn-out land can be brought to fertility by their use. Excellent results can be obtained by growing grass and plowing it down.

Dr. Smith. In the discussion of fertilizers one essential point must not be overlooked, and that is the quality of the soil. I don't see how any one can oppose the use of animal manure as a fertilizer. On stiff clay soil it is specially valuable, as it has a tendency to make it light and porous. As stated by Mr. Engle, barnyard manure varies very much in value, depending upon what is fed to the animals and whether kept under cover or in the open air. When exposed to the sun and rains for a year or more it is almost worthless, the greater part of the most important elements of plant food being lost. At times there is

no doubt considerable difficulty in getting a supply of animal manure, but it goes without question that for the gardener and fruit grower it is an extremely valuable fertilizer and is almost indispensable to success.

In regard to chemical fertilizers, an important point is to get them from honest dealers. In some States (New Jersey, for instance) the laws provide for rigid inspection of commercial fertilizers, and consequently they are generally found as represented. For peach trees my own experience has been that any fertilizer strong in potash can be used with great advantage. I should use nitrogen sparingly.

Mr. Brinser. Will Dr. Smith tell us what super-phosphate is?

Dr. Smith. Super-phosphate is bone ash, bone charcoal, or other phosphatic material dissolved in sulphuric acid. It is rich in phosphoric acid and is a valuable fertilizer. Bone ash contains 15 per cent. of soluble and available phosphoric acid. Bone charcoal, or "bone-black" as it is generally called, contains 16 to 18 per cent. By burning the bone the nitrogen is lost. As the result of four years' experience, I would prefer muriate of potash to Kainit for peach trees.

Mr. Barnhart. I have been engaged in farming for a number of years and have never spent a dime for commercial fertilizers. We have limestone land and need no other fertilizers when we have plenty of barnyard manure. We apply it once every two or three years and always raise good crops. My experience is that with lime, manure and clover we can grow any crop we want, and when we drop them we fail.

Prof. Butz. In regard to Prof. Meehan's views as to value of commercial fertilizers, I have in mind an experiment made at the Experiment Station at State College several years ago. I have not the exact figures, but can give results approximately.

As soils differ very much, sand was used for the experiments, as it contains but little plant food. Four series of experiments were made:

1st series, without any fertilizer.

2d series, with aqueous soil extract.

3d series, with pulverized peat.

4th series, with sodium nitrate and ammonia sulphate, with the following results:

Maize is unable to utilize peat nitrogen nearly as well as it can that of nitrates. About one-twentieth of the nitrogen offered as peat was taken up by the maize plants; about one-third of that offered as nitrates. The total crops when nitrates were used was nearly nineteen times greater than when no nitrogen was applied. With peat nitrogen the increase was not quite fourfold.

The experiments referred to are reported upon in detail in the annual report of the Experiment Station for 1889, pages 195 to 206, with illustrations. They were instituted to investigate two questions: 1st, can maize take up any of its nitrogen indirectly from the atmosphere through the agency of the micro-organisms present in the soil? 2d, can maize obtain its nitrogen from that present in insoluble organic compounds, as in decayed roots, barnyard manure, peat, etc., and what is the relative value of nitrogen in this state of combination compared with that present in the form of nitrates?

For a discussion of these questions as affected by the results of the experiments, I respectfully refer you to the aforementioned publication.

Mr. Fox submitted a list of 51 members from Berks county who have renewed their membership for 1893.

Mr. Cooper, of Committee on World's Columbian Exposition, stated that said committee would be ready to report at a subsequent session. On motion, the matter was held over for the ensuing session.

The following committees were appointed by the president:

On Exhibits—E. C. Brinser, E. W. Thomas, D. D. Herr.

To Audit Treasurer's Statement—Calvin Cooper, Thomas Rakestraw, John G. Engle.

The president stated that Dr. Smith, of the Department of Agriculture, Washington, D. C., would at the evening session speak on "Peach Yellows and Plant Diseases," and he hoped there would be a full attendance.

Adjourned.

EVENING SESSION.

Annual Address of the President.

Were it not for the fact that the custom which annually calls for an address from the president of this association is one which has been so long and faithfully observed that any violation thereof might be looked upon as a misdemeanor and unworthy of a loyal horticulturist, I would ask to have it omitted for this year.

Assembled here within these walls of justice and occupying the seats of eminent jurists of this and past decades, it is to be hoped that the surroundings may serve to inspire our meetings with such justice, wisdom and knowledge as are wont to be heard within these halls.

One year since we met in the town of York, and now we assemble here to render our account of what the horticultural harvest has been, to impart the knowledge acquired, to seek advice and instruction in reference to our failures, to renew the social feature which prevails when those engaged in like occupations meet thus together.

There must necessarily be a great similarity in the reports of the successes and failures to be chronicled annually in our society. These are so ably and accurately reported by our worthy chairman of the General Fruit Committee, that a detailed statement in this address is uncalled for.

In our profession there are theories advanced yearly as to how to obtain increased productiveness; how to obtain perfect fruit; how to market fruit to the best advantage; how to reap the golden harvest most easily and quickly; how to amass a fortune and become an example for future horticulturists to follow; to be able to distinguish between the theoretical and practical, between the ideal and the real; and better than all to be able to make the ideal the real, is one of the objects we are aiming to attain. We are told that man is born to trouble as the sparks fly upwards, and surely the horticulturist is no exception to the rule. For depending as we are upon the elements whose influence upon our crops is unlimited from the swelling of the

bud to the gathering of the fruit, beset by multitudes of insect pests, either seen or unseen; subject to adaptability or otherwise of soil and location; made the victim of human sharks to whom our hard-earned crops are consigned, surely our path is not all strewn with roses even if they may surround our dwellings.

That an interchange of views on these topics is beneficial and helpful, none can deny, for have not the reports of the failures and mishaps of others served to make our own seem more bearable, and incite us to increased energy to overcome future difficulties as they may arise, while the reports of the successes of others only serve to increase our desire to make them our own? For these objects this association was formed and for these objects it is continued. Is not it a query with many why our numbers do not increase more rapidly in view of the fact of the largely increased interest in fruit growing within the State, and of the great advancement in horticultural adornment to be noticed, not only in the suburbs of our large cities, but throughout the rural districts? It would greatly encourage us to be able to number our members by hundreds, and the question of how to increase our membership may be a profitable one to receive some attention at this time. Though our numbers may be but few we have the satisfaction of knowing that the advanced ideas on horticulture so long and earnestly advocated by this association are being acted upon all over the State, and are apparent from the greater care manifested in the selection and treatment of fruit trees and small fruits, and in the largely increased planting of ornamental trees, flowering shrubs, vines, &c. The assignment of one or more topics on horticulture on the programs of the popular farmers' institutes, being so successfully conducted throughout the State under the guidance and direction of the very able Secretary of the State Board of Agriculture, is an evidence of the increased interest on the subject, and is doubtless doing much to awaken an enthusiasm therein.

The influence of the practical and scientific education rendered possible by the greatly increased advantages now so easily obtained by a scholarship at the State College, must have an effect for good in offering to the sons of our rural population an opportunity of obtaining a better education at less expense than was heretofore obtainable. Not only is it a satisfaction to know that our efforts are productive of good in our own borders, but it would also afford us great pleasure to be able to have an opportunity of showing to the world at large the results of our achievements in the various branches of horticulture. The indications which, a year ago, seemed so probable that the State of Pennsylvania would have a creditable exhibit of this character at the World's Columbian Exhibition to be held in Chicago this year, become more doubtful as the time approaches, and unless some unforeseen circumstances conspire to produce it, the results will not be any credit to the State possessing, as we believe, the greatest and most varied products of a horticultural character of any in the Union.

While it is not my desire to cast any improper reflections or severe criticism on the actions of others, yet as one of the representative bodies of the horticultural interests of the State, and one which stands, as it were, as one of the sponsors for the horticultural reputation of the State in the exhibit of that class of products at the World's Fair, it is but right in my opinion that we should meet the issues

squarely, and if nothing more can be done, then that we should disclaim any further responsibility in the matter. For this reason I ask you to bear with me for going so fully into detail as I shall necessarily have to do. Believing that with me you will agree that public office is a public trust and that the acts of the officers are open to the criticism of we, the people. As you are no doubt aware the sum of \$7,000.00 was set aside for the horticultural exhibition to be made at Chicago; that an executive committee was named for this State, and that commissioners of the different departments were named to have charge of working up and making them successful, being in a measure subservient to the Chief Executive. At the head of the department of horticulture was placed a gentleman whose business career had doubtless been successful, and one who was probably an expert in the line of business which he had familiarized himself in, but with a knowledge of the department over which he had accepted a commission to serve, as meagre, and ideas of the requisites necessary to make a horticultural exhibition a success, as vague as could well be imagined or conceived. To aid and assist in this work was appointed a secretary, at a salary of \$100 per month, whose knowledge of most branches of the profession were but little in advance of his chief. Thus equipped the executive board of horticulture entered upon its duties early in 1892. 'Tis true an advisory board was invited to assist and co-operate. This association accepted the invitation and named two members; the Pennsylvania Horticultural Society of Philadelphia named five; the Germantown Horticultural Society added two more, and four were to come from Allegheny and Pittsburgh. This, as it were, in confirmation of the traditional fatality of the number 13, the advisory board had its birth, and almost with its advent, we might say, its demise. A few meetings of part of the members were held, but they were as useless and aimless as a disabled ship without a pilot or helm; and finally, as if struck by a blizzard, the wires all down, the steam exhausted, the purser nowhere to be found, their traveling expenses unpaid, the committee paused to consider whether Columbus really did discover America or what all this fair was about, and wisely concluded to get home on their unused excursion tickets, mind their own business, and thus reduce the number to be the recipients of the loaves fishes. While the sum of \$7,000 dollars was looked upon as being absurdly low to make a satisfactory exhibit of the various horticultural products of the State, and not more than one-third or one-fourth of the amount required, yet from developments and the manner it is now being expended, the amount is much greater than, in our opinion, will be used judiciously. The secretary originally appointed, after several months useless service, was displaced; the commissioners of all the departments were asked to resign in order that experts might be appointed in their stead. All but two of these did resign, those at the heads of the departments of horticulture and art refusing to do so. We believe they are still holding office. A gentleman standing at the head of the florist profession in Philadelphia has been assisting the commissioner in endeavoring to make a State exhibit under some agreement upon which the searchlight of the advisory board has never shown, their plan of operation being to secure choice specimens from the conservatories of the wealthy in and around Philadelphia and elsewhere. These are obtained either by gift or loan in most cases we believe,

and sent to the horticultural building in Chicago at the expense of the State. Many of the specimens having become too large for small conservatories were sent last fall. Further than this we know of no effort being made to give any other of the departments of horticulture a place either in the buildings or on the grounds at Chicago. One of the members of the advisory board from Pittsburg received an appointment as landscape architect to lay out the grounds around the Pennsylvania State building at Chicago, but upon being asked by another member of the board if he could find a place for a novelty which he desired to donate anywhere on the ground, let it be known he could buy all that was needed for that ground, and that no foreign interference would be tolerated. Now, gentlemen, if any of you go to Chicago, as you doubtless will, we advise you to visit the horticultural building (which is a magnificent one) and inquire for the horticultural products from Pennsylvania, and see if you recognize any of them as among the natives of your own State. Visit the grounds and see if any of the beautiful exhibits which characterized the plantings in Fairmount Park during the Centennial are to be found there to the credit of any Pennsylvania exhibitors. Visit the pomological department and, if we mistake not, the Pennsylvania goddess, Pomona, will be notable for her absence. After doing all this, stop and consider whether any but the rich enjoy this life and possess the means of obtaining notoriety by their liberality. Stop and consider if, in your opinion, the money set aside to make a horticultural exhibit at Chicago befitting the great State of Pennsylvania has been wisely and judiciously expended. We are told patriotism should incite us to uphold a State pride. Patriotism is, no doubt, a glorious sentiment, but, unfortunately, patriots do not like to see money set aside for the purpose intended being expended in certain lines, and then open their own purse strings to make good the deficiencies of others.

Gentlemen, having alluded to the shortcomings within our borders, let us for a moment cast our eyes around and see how our neighbors may be doing in this work. I can only speak knowingly of the little State east of us, and will it surprise you when I say that at the last meeting of the New Jersey Horticultural Society it was announced that arrangements had been completed at Chicago for a large refrigerator in which the various perishable fruits for which the State is so famous would be exhibited, and that shipments in refrigerator cars would be made frequently during the season, and that great pains had been taken to complete all arrangements for an exhibition of the fruits of New Jersey. This department being under the direction of a practical horticulturist, one of the most successful growers and an indefatigable worker in that line, is likely to be a success. Now, fellow members, if you know of any way to bring order out of chaos and to gain the benefits to which we are entitled, it is our prerogative to be heard at this time and place.

The following report of Committee on World's Columbian Exposition was read by the secretary:

To the State Horticultural Association:

Gentlemen: The committee appointed by your association one year ago to serve on the advisory board of horticulture for the State of Pennsylvania to aid in making an exhibit on behalf of the State at

the World's Columbian Exhibition to be held in Chicago this year makes the following report:

Immediately after the last meeting we conferred together and were united in our opinion as to the methods necessary to make an exhibit, as well as united on the impracticability of making a creditable display with the sum set aside for that purpose, viz: \$7,000. Your committee, one or both, were present at nearly all the meetings on the subject held in Philadelphia during the first three months of 1892. An appeal was made to the executive commissioner for a larger appropriation, but to no effect. At the last meeting they attended they were informed of this decision. Since then they have heard nothing further in regard to any meetings of said advisory board, and in their opinion believe that the board has become extinct, as they know nothing whatever of its workings or what is being done in this line, except as seen in public print and from hearsay testimony, which they do not consider advisable to include in this report. We therefore ask to be discharged from our appointment.

Very respectfully, &c.,

JOSIAH HOOPES,
WILLIAM H. MOON.

Mr. Chase. I had the pleasure of attending several preliminary meetings of the advisory committee in Philadelphia, and was satisfied that the result would be as stated in the report just read. As a Philadelphian I have no interest in making an exhibit to represent a few florists and cut-flower dealers in Philadelphia. If Pennsylvania is not creditably represented in the horticultural display at the World's Columbian Exposition, it will not be the fault of this society. In New Jersey and New York committees have for some time been at work to arrange for creditable displays, and they will doubtless have exhibits of which their States may feel proud. While in some respects Pennsylvania cannot compete with New York in her fruit display, she would be second to none in her display of native plants and flowers.

Mr. Edge. Has your committee conferred with Mr. Woodward? The whole matter has now passed into his hands and I am sure he is anxious for a first-class horticultural display and will render all the aid in his power.

Mr. Meehan. So far as our firm is concerned we could have made an extensive exhibit, but have been crowded out from any display. During the Centennial in Philadelphia we made a very full and complete exhibit at a cost of \$3,000. Had eight acres, all named and labeled. In exhibitions of this kind it is necessary to have plants and trees in tubs for a year.

Mr. Cooper. What has become of the \$7,000?

Mr. Moon. Echo answers, What! I think the matter may as well be abandoned as far as the present committee is concerned. There may be others who would like to take it up and try to make it a success. I think it would be best to appoint a committee to confer with Mr. Woodward and report to the society to-morrow.

Mr. Chase moved that the whole question be referred to a committee of five of which the president of the society be chairman, be appointed to consider the matter and report at a future session.

The motion was adopted and the following committee appointed in accordance therewith:

W. H. Moon, chairman, H. A. Chase, Geo. C. Butz, Calvin Cooper, W. P. Brinton.

The following paper was read by Prof. Geo. C. Butz, State College, Pa.:

HORTICULTURAL EDUCATION.

An interesting controversy upon this subject has been published in the leading horticultural journals in the past year. The discussion exhibits the progressive and the retrogressive elements in the ranks of horticulturists. The former is always on the alert for the new and improved in materials and methods which are discovered or originated in the four corners of the earth, while the latter is content with the old methods and old varieties; and, to quote the words of one of these, "There is to-day many a one in business for himself who is racking his brain how to make both ends meet." The discussion began with the announcement that the Leland Stanford, Jr., University of California has established a department of instruction in which may be obtained a broad education in horticulture and floriculture. A correspondent commenting upon this notice said: "It is my opinion, after due consideration, that every practical man in this calling or profession should oppose it. This business is not suffering from the want of educated help. There are over and enough intelligent and practical men in this calling." I trust there is no one in this audience who would echo this sentiment. A man with a broad education in horticulture will work on a broad basis and make capital of every opportunity within his reach.

He will cultivate fruits, flowers and vegetables not only for his neighbors, but his products will be found in the larger markets and transported over the principal freight lines. He will, by intelligent selection, improve and extend the lists of economic plants of cultivation, and thus leave some mark of his usefulness to be recorded upon the pages of horticultural science. Education makes men intelligent. Intelligent men augment and elevate the standard of their occupation. Therefore, the more intelligent men that can be attracted into the field of horticulture, the higher will be the standard in which we labor. The "Gardener's Chronicle of England," for September last; commenting upon the work of a student of horticulture in Cornell University, makes this statement: "Our American friends are a long way ahead of us in these matters, and while we gardeners are moaning over a low rate of wages, the overabundant supply of gardeners, and the inadequate social status, the Americans are extending the bounds of horticultural science, supplying a more thorough education, recognizing talent by means of university degrees, and thus, while raising the whole standard of efficiency, they are lifting the gardener to the position he ought to occupy."

It is the fashion of our colleges now to divide the attention which was once wholly directed towards books and languages, to develop men for the so-called professions, and therefore we find these institutions lending a helping hand to develop men for the important industries of the world. They have the workshops with the carpenter's bench, the blacksmith's forge, the turning lathes, etc., yet mechanics do not

oppose the establishment of such departments of instruction. In such work the students are taught to use books only as supplementary guides in the use of materials, and the same is true in the departments of horticulture. When properly established there is the orchard, the vineyard, the vegetable garden, the greenhouse, the nursery and the flower garden. By a course of study in connection with work among plants, a student may acquire a basis of intelligence upon which he can expand in after years as his opportunities will allow him.

You will say that experience is the best teacher. That is true, but it is also a very slow teacher, and often a very expensive teacher. A student learns to profit by the experience of careful workers, and it pays him to devote a few years of study upon the learning of the past and present, and become able to use such light to guide his future steps. With such knowledge, horticulture gives a hopeful field of labor to the gardener and orchardist.

The object of the longer courses in horticulture is to prepare men for work of experimentation upon lines that will require specialists who will be fitted to pursue a definite plan of action. Such a course is, perhaps, more extensive and scientific than the average horticulturist would choose for himself, and therefore the agricultural colleges have been carefully devising shorter courses that will meet the wants of other students.

A small amount of systematic study is often enough for some young men to guide them into a course of self-training or self-education. When this is accomplished there is little need for a teacher. A school does not aim to fill a student with all the information necessary to make a finished horticulturist, but it is satisfied if it has opened up to him the proper fields of study, established habits of acquiring knowledge by observing carefully and reasoning logically.

What are the subjects that claim the attention of the horticulturist, and to what extent he should pursue them? These questions deserve some consideration. The first subject suggested is botany. Every person handling plants of any description should familiarize himself with botanical language. It is more precise and complete than that of any other science, and teaches the student to be accurate in the expressions of his thoughts and observations. It points out the relations existing among plants by classifying them according to their botanical affinities; it creates a new love for plants by defining the morphology of their parts and by tracing out the course of evolution through which over 100,000 species have been established. It teaches us to recognize the variations and monstrosities of plants and, as far is known, how to produce them. This study is absolutely necessary to a full understanding of what is written about plants by careful writers, and to be able to speak of plants intelligently.

Cryptogramic botany treats of the strange forms of vegetable life and explains the causes of many serious diseases of both animals and plants. It is a study that requires the aid of a microscope often to find the minute plants which it describes. Every horticulturist must be a plant physician and to him the cryptogramic botany furnishes a key to the cause of mildews, rusts, rots, and many blights.

The physiology of plant life cannot be too well understood. Upon this depends the successful growing of plants. The most general observation will detect the effect of temperature and moisture, and de-

termine that plants depend upon the air and soil for their foods. Pruning and training play an important part in the life and usefulness of a plant, and therefore a careful study of the operations as performed in various countries and upon different plants is an essential part of a complete course.

Entomology demands some attention, and the study of insects may be made a pleasant diversion for the gardener as well as an unpleasant one. He may learn by experience that insects will annoy him on all sides, and that there are so many as 100 different species which may do considerable damage to his crops. This seems discouraging, but by a study of the subject of entomology we learn that the real enemies of the garden comprise an exceedingly small part of the class of insects. One entomologist estimated that the insects numbered four-fifths of the whole animal kingdom. While there are about 53,000 species of animals known, excluding insects, there are about 200,000 known species of insects. By a study of the life, history or habits of insects we prepare ourselves for a more successful warfare against them.

We must direct some attention to plant chemistry to understand something of the foods required by plants to secure perfect development. Many discoveries of plant foods in past years have been the results of accidents, because there was but little knowledge upon this subject. With an acquaintance with the chemical composition of plants and their foods, we can readily determine by an analysis of a substance what its value as a plant food would be.

These three subjects—botany, entomology and chemistry—may be considered as the theoretical side of a horticultural education, and it is not proposed to carry these studies on to the extent of making of the student a botanist, entomologist or a chemist. Even a limited acquaintance with these subjects will make clear the reasons for many of the practical operations and conditions of horticulture.

On the practical side of such education we may consider such subjects as propagation, and illustrate the various methods by performing the operations with proper materials. Special culture may be studied with profit and yield suggestions to the student upon careful and successful cultivation. The care of the vineyard and the orchard; the preparation and use of insecticides and fungicides; the construction of greenhouses and their management; the improvement of varieties by crossing and hybridizing; the existing varieties compared with their original types, all these subjects call for careful practice and consideration.

Perhaps the longest course laid down by any institution in America is that of the Missouri Botanical Garden in 1890. This is in the nature of an apprenticeship, and requires six years for its completion. During the first year the pupil is required to work ten hours daily as a regular employee of the garden. In the second year he must work five hours daily and devote the rest of his time to thorough reading upon gardening and fruit culture, besides keeping the run of the current papers. In the third year he must work five hours daily and read upon forestry, elementary botany, landscape gardening and surveying. Some aid is given by instruction. In the fourth year, besides the customary work, he studies the botany of weeds, vegetables and fruits, and is taught book-keeping. In the fifth year, besides the

customary work, he takes up the subjects of vegetable physiology, economic entomology and fungi. In the sixth year, besides the manual work, he will study the botany of garden and greenhouse plants.

This course is designed for young pupils and is intended to make of them only practical gardeners. Only six such scholarships were established, therefore the number of pupils will always be small. This course of instruction is a good illustration of the value of careful and systematic reading. Any person living and working among plants can acquire a very good education by pursuing at the same time a well-selected course of reading upon horticultural subjects. Careful guidance is essential to success, otherwise a very great amount of unprofitable reading might be done that would create a distaste to learning. The fact that definite material is recommended indicates that something valuable in it is to be found, and the student will feel that he has a definite question to answer to himself. In such a course of training like that offered at the Missouri Botanical Garden, practice is placed first in importance which, of course, makes the best practical man; but the number of men received is small and the time is long.

Let us look next at the four years' course of study in the Agricultural colleges which offer horticulture as a specialty. Such a course aims to afford a well-rounded education and training of the mind in all the natural sciences. As much practical work is given upon the operations and methods of gardening as time and opportunity will permit; but upon graduation the student from this course will expect to accept an inferior position just as a graduate of the civil engineering course would be content to drive stakes and carry the chain. This is done, however, with the expectation of promotion when proof of proficiency is given.

Next to a general course in these colleges there is offered in a few of them a short course made up principally of lectures, supplemented with a series of exercises calculated to impress the mind with the subject of the lectures. Harvard University last July gave a summer course of lectures on horticulture consisting of twenty-one lectures, and eight hours daily work and conference. The Arnold Arboretum offered unequalled facilities for the study of shrubs and trees. The summer is, of course, the best season of the year in which to study about plants, but it is also the season in which young horticulturists are most busily engaged at their homes.

The winter course of lectures as offered by Cornell University, the Pennsylvania State College, and a few other similar institutions, is more easily attended. Every young man should aim to get a few months' training at a college. Aside from the benefit of a special course of study, he will be inspired in his search for information by the mere contact with students.

The course to which I wish to call your especial attention at this time is one that should commend itself to a very large class of people who cannot reach even their nearest college for a lack of time or money or both. The Pennsylvania State College is the first institution to apply this system to studies in agriculture and horticulture. Since the establishment of this course the Michigan Agricultural College has adopted the same plan. It is known as the agricultural Chautauqua course. It aims to reach the student at his home at a time when he has leisure. It directs him in a course of reading which, if

carefully pursued, cannot fail to result in much good. The complete course includes fifteen books, which are divided into three groups of five books each, namely, crop production, live stock production and horticulture and floriculture.

Any one or all of the groups may be chosen and taken up in any order which the student may desire. When a subject has been completed the student, upon notifying the college, will receive an examination paper to which written answers are to be returned. If a grade of more than 70 on a scale of 100 is attained in the studies of any group of subjects, a certificate to that effect will be issued by the college, and if a grade of more than 80 is attained in any two groups of the course, a suitable diploma will be given to the successful student.

The books selected for this course are such that require study to be profitable, and it is recommended that wherever and whenever it is practicable, materials at hand should be continually employed as they are treated of in the books. Students are in constant correspondence with the college until the course is finished, and receive various kinds of help and suggestions upon the best methods of study.

I have brought with me a set of the books referred to in my paper, and anyone wishing to examine them can do so. The college has been much flattered by the progress the course has made, and has students not only among young but older people. It goes further, and where there are societies that are sufficiently interested to take up a course of study it will send a lecturer, statedly, to address them. The college has also had requests for students educated in the course, and situations are always open to those who are competent. I have here several pamphlets explanatory of the course and methods of instruction, which I will leave for examination.

On motion the paper was received and a vote of thanks tendered Prof. Butz for same.

Mr. Fox. I hope those interested will take Prof. Butz's pamphlets along and carefully consider them. Our home society has taken up a course, and Professor Armsby will address our next meeting February 4th. I hope to see our young men so well versed in agriculture and horticulture that there will henceforth be no trouble in keeping our boys on the farm.

Mr. McDowell. Although I am not a member of your society, I am much pleased with the essay just read, and endorse the views advanced by the essayist. At a meeting of our State Agricultural Society, Dr. Kennedy advocated an elementary training in agriculture and horticulture in our public schools as part of the regular course of instruction. Children are interested in specimens and cabinets and learn by the eye as well as the ear. They are not too young or small to notice a plant, a flower or a berry, and these should be taught and explained in the schools. I think our schools need something of this kind and I hope some plan may be crystalized and put into shape, if not by this legislature by the next one.

PEACH YELLOWS.

By Dr. ERWIN F. SMITH, *Division of Vegetable Pathology, U. S. Department of Agriculture, Washington, D. C.*

First Appearance, Present Distribution, etc.

"Yellows" is probably the most destructive disease of fruit trees in this country. It appeared about one hundred years ago near Philadelphia and was first described by Judge Peters about the year 1806. According to his statements it was then limited to the vicinity of Philadelphia; it is now known in Canada and the States of Massachusetts, Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, Kentucky, Ohio, Michigan, Indiana and Illinois, and it is also reported, somewhat doubtfully, from Arkansas and Texas. There is no evidence of its occurrence in the Gulf States, on the Pacific Slope or in other parts of the world.

It is difficult to picture to an uninformed person the "clean sweep" which this disease makes when it has once obtained a foothold. In Newcastle county, Delaware, large areas are infected, and peach growing, which was once the chief industry, has been almost wholly abandoned. The same is true of a portion of northern Maryland, east of the Chesapeake bay, and of parts of New Jersey, Connecticut, New York, Pennsylvania and Michigan.

Symptoms.

Usually the first symptom is premature ripening of the fruit on one or several branches of the tree. Sometimes the disease is manifest only in a single peach or a few peaches on a small branch. The fruit is insipid in taste, the flesh is streaked and spotted with red, and the skin has a peculiarly mottled or red-spotted appearance. Often when the first symptoms appear in the fruit, the leaves are not yellow and the tree seems particularly vigorous. Another symptom is the premature pushing of the winter buds, sometimes in June or July, or even as late as December. This is a very characteristic symptom. Sometimes, on the start, and always after some months, or the second season, the leaves on the affected branches become yellowish, the growth of leaves and shoots is stunted, and there is a strong tendency to the formation of wiry-branched shoots on the trunk and limbs. In many cases part of the tree remains in apparent health and vigor for a year or two, but all of it finally succumbs, and the trees are usually killed in from three to six years.

I have never noticed any uniform and characteristic symptoms in the trunk or roots by which the disease can be diagnosed. In a great many cases the bark of trunk and roots is very smooth and sound.

Some things which are not the cause of "Yellows."

It is not caused by insects. It has been ascribed to borers, aphides, mites, scolytid beetles, etc., but no good evidence has been advanced to prove that they are the cause.

It is apparently not due to any of the higher fungi. Certain common fungi, which have been suspected at one time or another, are not constant on diseased trees and are common also on healthy trees and in regions free from "yellows." I must take issue with Mr. Meehan's statement that it is due to a root fungus. It is almost certainly not due to any root fungus, for the following reasons: (1) Plums worked on peach roots do not take "yellows," with exception possibly of Japanese sorts, while peaches on plum roots do. (2) A majority of the diseased trees in Maryland and Delaware are entirely free from root fungi when first attacked, and most of them remain as free as any other decaying trees. (3) Mr. Meehan attributes this disease to *Agaricus melleus*. I have never seen a specimen of this fungus in a peach orchard, and it is certainly not abundant in the districts where I have studied peach "yellows." (4) This root fungus occurs in regions where "yellows" has not appeared, viz, the Gulf States, California, and in all parts of Europe. (5) The disease can be induced by bud inoculation, the diseased parts being taken many feet from the supposed root fungus, and being entirely free from the mycelium of *Agaricus*, as shown by microscopic examination. (6) When diseased trees are rooted out and healthy trees are planted in their place the latter are not more likely to contract the yellows than other trees in the orchard, which would hardly be the case if the soil were full of a root fungus.

I am satisfied also that the disease is not caused by root or bark injuries when made by plow or borer, or by accident or carelessness. I have seen the disease in hundreds of uninjured and very thrifty trees, having examined a great many with this point in mind.

Winter freezing has been alleged to be a cause, but I cannot find any proof of this belief, and there are some serious objections. The disease did not first appear on the northern line of peach culture. Neither did it appear in Sussex county, Delaware, or Caroline county, Maryland, following the severe freezes of 1881, when many trees were killed outright, and the rest seriously injured for years. Many trees have since rotted out that did not die from "yellows." These localities were, until within the last year or two, entirely free from "yellows" and are still nearly free.

Early autumn frosts have also been cited as the cause, but no evidence has ever been adduced to prove it beyond the very inconclusive one that "yellows" did not appear in one or two greenhouses where a few trees were grown. I cannot find that those varieties that hold their foliage late into the autumn are more liable to "yellows" than those that drop their leaves early. All varieties are subject, and sooner or later the disease takes the whole orchard.

Excessive rainfall has been named as a cause, and this was a favorite hypothesis of Judge Peters; but experience in Maryland and Delaware from 1886 to 1892 clearly disproves this. By far the rainiest season of the six was 1889, and there was a marked decrease of cases that year.

Over-production of fruit has frequently been claimed as a cause of "yellows," but my experience and observations in Maryland and Delaware, during the last five years, overthrows this view completely. For a series of years, owing to spring frosts, etc., there has been no crop, or only a very light one, but the "yellows" has kept right along, developing, with one exception, more and more cases each year. The

year 1888 was one of excessive production, and although there were a great many cases, there was not any marked excess, such as this hypothesis requires; nor was such an excess visible the following year as the result of weakening. On the contrary, there was a great falling off of new cases in 1889. Again, 1889 was a year of scanty yields and few cases, but this year was followed by absolute barrenness in 1890, with a great increase of cases, as many as in the year 1888, when every tree was full to breaking. In the year 1892, also, most of the orchards in Maryland and Delaware were barren, and yet there was an enormous increase of cases, more, perhaps, than any previous year.

Defective physical conditions of the Soil.

I consider this hypothesis very doubtful. This disease occurs on all kinds of soils, and every year over a wide area. In my experience, however, it has been worse in dry seasons and during prolonged drouth. It often first appears in low and moist parts of the orchard when the trees are making a large growth, but never remains confined to such places.

Soil Poverty.

This is a very favorite hypothesis, but, unfortunately, one not borne out by the facts. I say unfortunately, for, if it were true, the use of fertilizers would be an easy solution of the problem. "Yellows" occurs in a wide variety of soils, sands, loams, clays; limestone, sandstone granite; on virgin soils and those long under cultivation; on barren soils and on fields where the peach tree makes a vigorous growth and where other crops do well. It often occurs in the best fields on a man's farm, and frequently puts in its first appearance in those portions of the field where the trees have made the most vigorous growth and seem to promise the best.

Department experiments with fertilizers in Delaware and Maryland during the past four years have not stayed the progress of this disease and have not resulted in any cures. Lime, wood ashes, guano, potash salts, phosphates, nitrogen compounds, tobacco dust, etc., have all been tried on various soils, on trees of different ages and varieties, on a large scale, and in small, medium and large doses, all with the same result—no cures, no prevention. Plats which were given tons of wood ashes and of superphosphates and potash salts did not remain free from "yellows." More than this, they developed cases just as soon and in just as large numbers as those plats which received nothing.

Apparently the results would not have differed materially if only brick dust had been used. In some instances three years sufficed to ruin every tree on a treated plat.

As an illustration of the complete failure of fertilizers to prevent "yellows," the following facts are cited from these experiments, a full account of which will be published by the Department of Agriculture in a special bulletin.*

* Bull. No. 4. Div. of Veg. Pathology, Dept. Ag. 1893.

Orchard of F. H. Harper, Still Pond, Maryland.

Trees set in 1881. First cases of "yellows" in 1885. Orchard on a level loam, cultivation good, and growth of trees satisfactory.

I. Four treatments with a mixture of dissolved boneblack, muriate of potash, and kieserite, made as follows: (1) Spring of 1889, (2) fall of 1889, (3) spring of 1890, and (4) spring of 1891.

Result.—Two hundred and eighty-two healthy trees at the beginning of the experiment and 190 at the end. The count of cases was made each autumn and the per cent. of cases by years was as follows: 1889, 1.8; 1890, 11; 1891, 10.3; 1892, 9.6. Total in four years, 32.7 per cent.

II. The same treatments as above and two additional ones of muriate of potash in the springs of 1889 and 1891, making six treatments in all.

Result.—Two hundred and eighty-seven healthy trees at the beginning of the experiment and 182 at the end. Per cent. of cases by years: 1889, 2.8; 1890, 11.5; 1891, 15; 1892, 7. Total in four years, 36.3 per cent.

III. During the same period 852 untreated trees held for comparison gave the following per cent. of cases: 1889, 0.9 per cent.; 1890, 7 per cent.; 1891, 6.7 per cent.; 1892, 7.6 per cent. Total in four years, 22.3 per cent.

Orchard of M. Hays, Dover, Delaware.

Trees set in 1884. First cases of "yellows" in 1887. Orchard on a level, sandy loam. Soil cultivated. Growth of trees good.

I. Eighty trees, 40 per cent. already diseased. Two treatments with a mixture of dissolved boneblack and muriate of potash in spring of 1889 and 1890.

Result.—The per cent. of new cases by years was as follows: 1889, 2.53; 1890, 39.24; 1891, 11.39. Total per cent. of cases at close of the experiment, 91.13, including the 40 per cent. diseased at the beginning, none of which were cured.

II. Eighty trees for comparison; 30 per cent. already diseased. Per cent. of cases by years: 1889, 3.75; 1890, 41.25; 1891, 18.75. Total, 93.75 per cent., including the original 30 per cent.

Orchard of James Alex. Fulton, Dover, Delaware.

Trees set in 1887. First case of "yellows" in 1889. Orchard on level, sandy loam. Soil cultivated. Trees thrifty.

I. One very heavy dose of complete fertilizer in spring of 1890, i. e., dissolved bone ash and nitrate of potash, thoroughly dug into the earth around each tree.

Result.—Per cent. of cases in fall of 1890, 44; per cent. of cases in fall of 1891, 20. Total, 64 per cent.

II. Very heavy dose of incomplete fertilizer (nitrogen omitted, muriate being substituted for nitrate of potash) in spring of 1890.

Result.—Per cent. of cases in fall of 1890, 32.1; per cent. of cases in fall of 1891, 32.1. Total, 64.2 per cent.

III. Row of untreated trees held for comparison. Per cent. of cases in fall of 1890, 17.9; per cent. of cases in fall of 1891, 48.2. Total, 66.1 per cent.

From these figures it appears that the treated trees were not only not protected, but in two of the three orchards were even more subject to the disease than those which received no treatment.

The conclusion is, that while we know how to grow fine trees with chemical fertilizers, we do not know how to prevent or cure "yellows" by their use.

Nature of "Yellows" and Methods of Spread.

"Yellows" has been induced by bud inoculation and sometimes occurs in the nursery as the result of indiscriminate selection of buds, and has been carried therefrom to the orchard. Great care should be exercised by the nurseryman in the selection of stocks and buds, and by the orchardist in the selection of trees, particularly if he lives in a region still free from this disease.

The greater number of cases are evidently not derived from the nursery, and the natural methods of spread is still unknown. It seems almost certain that it spreads through the soil or through the air from tree to tree in the orchard, but in such an irregular manner as to be very perplexing. In this particular it is quite unlike the spread of phylloxera in vineyards, and of various root fungi, whose movement outward from centers of infection has been likened to the movement of oil on water. The cause of the disease is still unknown, but from what I have seen I am confident that allowing diseased trees to stand endangers the life and prosperity of healthy ones.

Budding on apricot or plum stocks will not protect, not even when peach buds of perfectly sound constitution have been used. The Russian apricot is also subject to this disease, and consequently the use of this tree as a stock affords no protection.

What to Do.

As to the best method of dealing with "yellows," axe and fire are the only means of protection yet known that have proven at all effective. We should make the diseased tree worthless from the start by forbidding the sale of its fruit. Premature peaches are unfit for use, and their sale is a fraud on the consumer and also an injury to the grower of good fruit.

Such fruit must not be shipped, and if found in the markets should be seized and condemned, the same as decayed fruit. Premature peaches are easily detected by their red-spotted skin and flesh and poor flavor.

All affected trees, even if there are several hundred of them, should be cut down, dug out, removed from the orchard and burned as soon as the first symptoms are discovered. If the owners of such trees will not do the work, then the State must do it through legally authorized agents. There is not much use of trying even this method unless the work is done promptly, thoroughly and persistently.

The following States or parts of States now have peach "yellows" laws, most of them having been enacted recently: Michigan, New York, Pennsylvania, California, Virginia, one county in Maryland, and the lower half of the State of Delaware. Ontario also has a law, and it is likely that some other States will soon fall into line.*

* The legislature of Connecticut has passed a "yellows" law since this was written.

The Working of the Michigan Law.

Having lived many years in Michigan and being quite familiar with the methods and results of peach growing in that State, and having last summer made a special examination of the workings of the "yellows" law in the southwestern section, which examination supplements one made two years previous, I feel reasonably certain of the statements I am going to make, and believe the members of this association will give them more weight than if they were merely drawn from hearsay or published statements.

The "yellows" in Michigan first appeared near St. Joseph and Benton Harbor about 1866 on trees that came from New Jersey, and spread rapidly over the section of the State that was then devoted to peach growing. In 1884, as the result of the ravages of this disease, there were less than one thousand trees in bearing in the vicinity of St. Joseph and Benton Harbor where there had formerly been many large orchards. In 1869 the disease appeared in the neighborhood of South Haven, and began to destroy orchards in the same way as it had done at St. Joseph. In 1875 the first "yellows" law was enacted in Michigan. It applied only to a small part of southwestern Michigan, and the county of Berrien, the then chief seat of disease, was excluded from the provisions of the law on account of the opposition of the growers who had badly-affected orchards. The law was amended in 1879 by its enemies, and almost proved a failure on account of the delays incident to its enforcement. It was subsequently twice amended by the friends of peach growing, and the law now in effect is a good law. It is strictly enforced in some localities, in others not, and there is a decided difference in favor of those localities where it has been enforced. In the vicinities of St. Joseph, Benton Harbor, South Haven and Douglas they now have finer orchards than ever before, and are making money out of peaches, while at Fennville, Watervliet, etc., where no attention is paid to the law, the industry is about ruined. In short, where the law is neglected the trees are rapidly dying out and the growers are discouraged. In these localities the disease is now as destructive as in upper Delaware, where it is next to impossible to keep an orchard in a healthy condition more than five years. There may possibly be some other explanation, but it looks as though the destruction of the affected trees from year to year is the secret of the continued successful cultivation of the peach along the lake shore in Michigan. Anyhow, this is the general belief of the growers and the burden of proof certainly rests with those who deny it.

The following inquiry from the "Query Box" was read by the secretary:

"Are other species of trees subject to 'yellows' besides peach trees?"

Dr. Smith. Yes. Apricot, almonds, and nectarines are known to be subject to the same disease.

Mr. Jamison. You stated that "yellows" sometimes appear on a single specimen of fruit. Does it not seem that it may have been carried by trees while in bloom?

Dr. Smith. It seems plausible, but I have not been able to satisfy myself that such is the case. Additional experiments designed to settle this point are not completed.

Mr. Brinser. It has been stated that "yellows" can be carried from tree to tree by the pruning knife. Is such the fact?

Dr. Smith. I cannot tell from my own experience, because the only large experiment I have been able to carry out was in a region subject to the disease. About one-half of the pruned trees took the "yellows," but so many cases appeared in other parts of the orchard (many more than was expected) that the matter is still in doubt. The only satisfactory place for such an experiment is a region free from the disease, and for obvious reasons this is difficult to secure.

Mr. Brinser. Then we are to infer from your remarks that you do not know what "yellows" is, how to prevent or how to cure it?

Dr. Smith. We know enough to convince us that it is a contagious disease, and that the only way to prevent it is to destroy the trees when the first symptoms appear. No positive cure has been discovered. Diseased trees can be made to look greener and apparently improved for awhile, but that is all. They still bear premature peaches.

Mr. Cooper. Is it more likely to attack trees that have been planted where trees having "yellows" have been recently taken out?

Dr. Smith. I do not think so. I have seen many healthy, bearing trees on spots from which diseased trees were removed. It is a common practice in Michigan to replant such places the spring following the removal of the affected tree. As to the enforcement of the "yellows" law in this State, it is much better to create a public sentiment in favor of removing all infected trees, than to compel growers to do so by sheer force of law; that should only be resorted to when persuasion is of no avail. I believe that in a few years all peach growers will see that their only safety lies in prompt attention to the matter, and that the law will be generally obeyed and cheerfully.

ILLUSTRATIONS.

I—Peach Yellows. Figures 1, 2 and 3 represent Delaware peaches (Old Mixon or Stump) which have ripened two weeks in advance of the proper time, and are red-spotted on the skin and spotted and splashed with red in the flesh. Figure 4 shows the green condition, on the same day, of the peaches on healthy trees and healthy branches of affected trees of the same variety. The peaches on diseased branches ripen from a few days to several weeks in advance of the season.

II—Peach Yellows. Blossoms and leaf buds opening in autumn. The right-hand shoot still retains its spring foliage. From all the other branches the spring foliage has fallen and that which remains has developed from winter buds which should have remained dormant until the following spring. These specimens were collected in mid October at Still Pond, Maryland, from the top of a tree.

III—Peach Yellows. A Delaware tree in the first year of the disease. The symptoms are specially noticeable on the base of two right-hand branches in front of the screen. Here are many upright, feeble, branched shoots that have been developed within a few months. Photographed the last of September, i.e., about five or six months from first appearance of symptoms.

IV—Peach Yellows. A Delaware tree in the first year of the disease. Symptoms in top of the tree at right and left hand on branches from which the spring foliage has fallen. Photographed the last of September.

V—Peach Yellows. A Delaware tree in the second year of the disease. All parts affected. Leaves yellowish. Branches and foliage badly dwarfed. In the upper right-hand corner, healthy foliage from a neighboring tree. Photographed the last of September.

VI—Peach Yellows. A Delaware tree in the third or fourth year of the disease. Whole top dead. A few feeble branched shoots on the main limbs are the only indications of life.

VII—Peach Yellows. Portion of a thirty-acre orchard near Magnolia, Delaware, showing condition nine years from planting and five years after first appearance of the disease. In seven years from the first appearance of the disease every tree became affected. This particular strip of the orchard received very large doses of wood ashes, but without profit.

VIII—Peach Yellows. Orchard of James Alex. Fulton. One of a row of twenty-five healthy trees dosed very heavily with nitrate of potash and dissolved bone ash in the spring of 1890. Eleven of these trees showed symptoms of the yellows the following autumn, and five more became affected in 1891. Photographed September 30. Effect of the fertilizer very marked.

IX—Peach Yellows. Same orchard as VIII. One tree from the next row of twenty-eight trees which received no fertilizer. Photographed the same day, and strictly comparable with No. VIII. Only five of these trees became diseased the following autumn, but twelve contracted the disease in 1891.

X—Peach Yellows. Tree affected in all parts as a result of the insertion of a diseased bud into the base of the stem two and one-half years previous. Three years old from the seed and badly dwarfed. In this experiment more than two hundred trees were inoculated. The first cases appeared in about one year's time, and none remained healthy longer than about two and a-half years. Only fifteen were alive at the end of the third year.

XI—Peach Yellows. Healthy tree for comparison with No. X, i. e., of same age (three years), and from same nursery, but not budded. This control included one hundred and twenty-five trees, and only one of them contracted yellows.

(This lecture was supplemented by lithographs and photographs, some of which are reproduced here.)

On motion of Mr. Fox a vote of thanks was tendered Dr. Smith for his able and instructive lecture.

The chair appointed Calvin Cooper and E. W. Thomas a committee to call upon Governor Pattison and invite him to our meeting.

Adjourned.

THURSDAY MORNING.

President Moon, after calling the members to order, stated that the first business in order was to decide whether or not an evening session will be held.

On motion of Judge Stitzel the subject was postponed until two o'clock.

Report of Committee on Columbian Exposition being next in order, Mr. Cooper stated that the committee had met Director Woodward, and must have another conference, but will be ready to report later.

Mr. Moon. When in conference with Mr. Woodward, he inquired whether this committee had full power to act for this association. As our authority in this matter has not been clearly defined, I think before we hold another conference this committee should be vested with full authority to act in behalf of our society.

Mr. Chase. I fully concur with our president in this matter and hope this committee will be granted full power. I make a motion to that effect.

The motion was unanimously adopted.

Election of Officers.

Mr. Rupp, chairman of Committee on Nominations, submitted the following list of officers for 1893:

President—Wm. H. Moon, Morrisville.

Vice Presidents—Josiah Hoopes, West Chester; M. H. Engle, Marietta; J. T. Smith, Swales.

Recording Secretary—E. B. Engle, Waynesboro.

Corresponding Secretary—W. P. Brinton, Christiana.

Treasurer—J. Hibberd Bartram, Milltown.

Librarian—Thos. J. Edge, Harrisburg.

On motion the secretary was authorized to cast the ballot of the society, and the aforementioned were declared duly elected.

Change of Date for Annual Meetings.

The following amendment to the by-laws, which was offered in writing at last meeting, was read by the secretary, and after being briefly discussed was unanimously adopted:

"The annual meeting of this association shall be held on Tuesday before third Wednesday of January of each year," etc.

Mr. Fox. I want to ask permission of this society to have printed immediately in pamphlet form 500 copies of report of General Fruit Committee for 1893. The expense will not exceed \$10.00, and as these reports awaken an interest in fruit culture they will be of some advantage to our organization. They will be distributed among our members and leading horticulturists and horticultural papers throughout the country as well as to kindred societies.

The publication was authorized unanimously.

The following paper was then read by W. M. Benninger, Walnutport, Pa.

FRUIT GROWING AMONG THE PENNSYLVANIA MOUNTAINS.

I find by personal experience that fruit growing in the Pennsylvania mountains is a grand success.

I had the pleasure of visiting a number of the mountainous counties in Pennsylvania last winter, doing grange and farmers' institute work, and I was very much surprised to find in all the counties the finest, largest and best-flavored apples I ever saw or tasted.

I saw fine specimens of the Ewalt, Northern Spy, King of Tompkins County, Baldwin and many others; also some fine winter pears—some Vicar of Winkfield that were very handsome and of better flavor than any I ever tasted. These fruits are grown without spraying, without special cultivation or pruning, and without fertilizers. They grow in the natural soil.

Now, I would like to gain some knowledge on this subject and hope that some of the many able and practical fruit growers present will give us some information as to why their fruits do so remarkably well in those locations. These sections are not new. There are many old trees there that are not affected by any pests and bear fine fruit; they even have not got the apple tree borer.

I believe it would pay many of us fruit growers and nurserymen to take the money we spend to destroy the pests and for fertilizers and buy some good land in such favorable fruit sections.

We could not only make money from the fruit we would grow, but we would also help to develop fruit culture in those sections.

One of the drawbacks in those sections is that they have not the proper system for packing and marketing. The only questions the farmers asked at those meetings were how to sell the fruit they had.

They said they had thousands of bushels of those fine apples and could not get twenty-five cents a bushel for them.

I bought one hundred bushels of fine Northern Spies at twenty-five cents per bushel and had them packed in sugar barrels. I sold them without trouble at 80 cents and \$1.00 per bushel, as they were so much better than any we had in our section.

I think it would be profitable to the nurserymen of this country to make an effort to develop such favorable sections into practical fruit culture.

I am most confident that over one-third of the State is a first-class fruit country, and right in the midst of the best markets, viz: the large and rich coal country. I believe it would be a good plan for this association to make an effort to have the State Board of Agriculture secure good lecturers for their institutes in Pennsylvania. To lecture not only on spraying, but to explain and instruct the farmers how to pack and market, as growers in all those sections seem to be ignorant of the system of packing. In regard to packing, I think a good plan would be to pack in boxes and have them returned same as berry crates.

I think it is a very important point to make fruit growing a success with as little expense and labor as possible, and to establish a market for all the fruit that can be grown. This will surely bring us a demand for more fruit.

I also find that a good many more apples could be sold in Pennsylvania at good prices if growers would make more of an effort to find a market. I am safe to say that one-half of the families in the rich Lehigh valley had no apples last winter and they would have been very willing to pay 75 cents a bushel for good, nice apples. Another good plan for this association would be to establish fruit growers' associations, and employ good, responsible men to find a market and handle the fruit.

This is not only true as to apples and pears; they are also growing the finest and best peaches in the Pennsylvania mountains. In Juniata county I saw thousands of baskets of the very best quality. There are a number of New Jersey and Delaware growers coming to Pennsylvania and setting out orchards on shares in Lehigh and Northampton counties.

This alone goes to show that those sections are adapted to most any kind of fruit without special care, for that seems to be the main question to successfully grow fruit without artificial means. The use of fruits, as well as the raising of the same, is very much neglected in a good many favorable fruit sections, and I believe we should make every available effort to develop such sections as rapidly as possible; this can only be done by educating the people in those sections.

I find a great mistake is made in those undeveloped fruit sections by tree agents and even some nurseries, by recommending to them too many kinds and too many new and untried varieties.

It may be of some interest to many of you where such land can be bought and at what price per acre. There are thousands of acres in Carbon, Monroe, Pike, Wayne, Susquehanna, Lackawanna, Luzerne, Schuylkill, Clinton, Centre counties and many others that can be bought at from fifty cents to ten dollars per acre.

The best varieties of apple for those sections I find are Smith's Cider, Ewalt, Grimes' Golden, Smokehouse and Baldwin, and in some sections the old Fallwater, Bartlett, Clapp, Beurre de Anjou and Kieffer pears; Mountain Rose, Crawford, Stump the World, and in some vicinities, Salway peaches.

In conclusion let me say that I believe it would be better for us to grow our fruit in sections where we need no spraying or use artificial means, and go to places where land and labor is cheap, and as near a good market as we can possibly get, and that I am sure we could find in the Pennsylvania mountains. I hope you will pardon me for tiring you so long with those rambling remarks. I will leave you this subject now for discussion as that is the main object of the essay.

Mr. Fox. I am aware that there have been some large crops of peaches in Juniata county, but I think Mr. Benninger's statement about millions of baskets is somewhat overdrawn. As to cheap land in this State, I do not think there is any that would answer for fruit growing that can be had at fifty cents per acre. Some months ago an agent for a Swiss colony was trying to locate a suitable tract, but could not get any at that figure. In regard to spraying, I must also take exceptions to the views set forth in the essay. I believe it is important to spray, and reports from Wayne, Monroe and Pike counties show favorable results from spraying apples.

Judge Stitzel. Mr. Benninger's paper is timely, and if suitable tracts for fruit growing can be had at such prices they should be looked up

and utilized. There is plenty of mountain land hardly worth the taxes that might be profitably devoted to fruit culture. One mistake many of our fruit growers make is in not giving proper attention to marketing everything of value. Several years ago in Michigan I noticed that in the large evaporating and canning establishments even skins and cores were utilized and sold.

Mr. Chase. I have had twelve or fifteen years' experience in fruit growing in Pennsylvania, and while I endorse part of the paper I must disagree with some of the ideas advanced. While I have had land at five dollars per acre, I have had to spend much more to get it into proper order. We cannot grow fruit without care or labor. When I send fruit to market I sell nothing that I am afraid to put my name to. In 1891, when Bartlett pears were a drug, I sold them in Scranton at \$1.56 per five-eighth bushel package, and in New York at \$1.50 per package. It requires time and attention to grow and market fruit properly.

Mr. Jamison. Mr. Benninger's reference to "millions of baskets of peaches" in Juniata county is a mistake, and I suggest that he amend it so as to read "thousands" instead of "millions." There is doubtless plenty of cheap land in the State suitable for fruit growing, but it would not prove profitable on poor land without labor and plenty of fertilizer. Some young men in our section leased land at \$5.00 per acre per year, payable in peaches, which they have cleared off and planted and are making it pay.

Mr. Brinser. In regard to cheap land, it always requires considerable work and expense for fertilizers before it will bring paying crops.

Mr. Benninger. I regret the error of statement in reference to peaches in Juniata county, and I accept the correction suggested by Mr. Jamison. I will ask the secretary to correct my paper and make it read "thousands" instead of "millions" as I have it.

In regard to cheap land, the kind I refer to is where our huckleberries are shipped from in car loads, near Mauch Chunk and along the line of the Delaware, Lackawanna and Western railroad to Wilkes-barre. Some land in that vicinity has been sold lately at less than ten dollars per acre, including buildings. The land to which I referred as being attainable at 50 cents to \$10.00 dollars per acre is brush and rocky. I have a brother who has broken up some of this land very cheaply, and has raised nice, clean fruit without spraying or fertilizers.

Mr. Engle. I have frequently stated that if, twenty or twenty-five years ago we had planted some of the cheap and available land in this State to apples, pears and peaches we would now be exporting instead of importing these fruits. We have plenty of mountain land that would produce good crops at a moderate expense. We have every facility for growing the finest fruit and ought to take advantage of it.

DISEASES OF FRUITS AND THE USE OF FUNGICIDES.

Remarks by ERWIN F. SMITH, *Department of Agriculture, Washington, D. C.*

The diseases of fruits and the proper use of fungicides for their prevention are subjects which have been under consideration by the Di-

vision of Vegetable Pathology of the Department of Agriculture for several years. We have investigated and experimented from Wisconsin to Florida and from Delaware to California, and are learning all we can in the laboratory and in the field about the nature of plant diseases and the best methods of dealing with them.

That this work is being appreciated by our farmers and fruit growers is evident from the many inquiries we receive from them in regard to plant diseases and to fungicides and their proper application.

In a hasty manner I will touch on a few of the more serious diseases with which the grower of fruit has to contend, and conclude with some remarks on methods of dealing with them.

Pear Blight.—By this is meant not leaf blight, but what is generally known as fire blight. This blight is probably the most serious obstacle to pear culture in the United States. A great many fine orchards have been destroyed and the disease is prevalent in some part of the country every year, but, curiously enough, has never been reported from the pear gardens of Europe. It is due to bacteria, which occur in the tissues of the tree and can be isolated from the plant and carried through an indeterminate number of generations on artificial culture media. The disease can be induced artificially by puncturing young growing fruits or tender shoots of the pear and inserting some of these microorganisms. It can also be induced by spraying the germs upon the blossoms. Mr. Waite has shown experimentally that the bacteria grow rapidly in the nectar of the blossoms and penetrate the tissues, and this is probably one natural way of entrance; another way is through the bites or punctures of insects. It is certain that insects aid in spreading the disease. It would also seem, from Mr. Waite's experiments, that the germ does not winter over in the blighted branches and consequently that a part of its life history is still involved in doubt.

No good fungicide has been found, i. e., one to kill the germ of this disease and not injure the tree, but the disease can be held in check by cutting out the affected branches promptly. Growers generally wait too long. As soon as the first symptoms appear the affected branches should be cut away. A few days' delay often spoils a good tree. I know a gentleman in Delaware who has a man to watch his orchard every day during the hot and wet weather, and has thus saved many of his trees.

Apple Scab.—This is also a serious fruit disease. It was worse in New York the past year than ever before. Not only the fruit, but the leaves were affected. In western Michigan, also, it was never worse than the past year, and thousands of dollars are lost annually in our apple crops alone. It is due to a little fungus which winters on the stems and which attacks the leaves very early and the young fruits

almost before they are out of blossom. It is a superficial disease, and except in seasons of wide prevalence, the serious injury is confined almost wholly to the fruit which is black-spotted, brown-roughened and stunted on the most seriously affected parts, so as to be irregular, unsightly and unsalable in the worst cases. This stunting comes about through the early formation of a protective, unyielding cork layer underneath the fungus. This disease can be prevented in great part at slight expense by the proper use of fungicides.

Grape Rot.—This is also very destructive over a large part of the eastern United States and has been introduced into Europe. I have seen the fruit spoiled on acres of vineyards year after year and the vines finally pulled out because of its ravages. It is due to a little fungus which grows on both fruit and vine, the spores of which enter the plant through drops of water. If it were possible to keep the clusters perfectly dry from the time they are set until they are picked there would never be any grape rot. This disease can be prevented in either of two ways: (1) by bagging the clusters, which keeps them dry, or (2) by the use of fungicides, which destroy the germinating spores.

Leaf Blight of Pear and Quince.—There is also a fungus disease which attacks the leaves of pears and quinces, causing them to drop from the tree in July and August, and thus preventing the proper ripening of the fruit and the formation of fruit spurs for the following year. It also attacks the fruit, causing it to spot and crack. On nursery stock it checks the growth so early in the season that budding is interfered with. I have seen pear and quince orchards as bare of leaves in August as in midwinter, and a little later a new growth of leaves and blossoms, which would also be attacked. Of course, such trees soon become unfruitful and barely manage to live. This serious disease can be entirely prevented by the proper use of fungicides.

Rot of Stone Fruits.—The brown rot of peaches, plums and cherries is very general and causes serious loss annually. This also is a disease due to a fungus, the ash gray tufts of which may be seen on any rotting fruit. It winters over in the shriveled fruits, which should be carefully gathered and buried or burned. This fungus produces an innumerable number of spores on the rotting fruits and these spread the disease to sound fruits very rapidly, especially in hot or wet weather. No satisfactory fungicide is known, but much can be done by the daily removal of rotting fruits from the orchard trees. In many cases this disease also attacks the flowers and young branches, causing them to blight, and is altogether a very serious enemy to the successful culture of stone fruits, especially in moist and warm climates. Frequently this pest wipes out the profits on whole car loads of early peaches shipped from the South, and sometimes destroys nearly an entire crop before it can be picked, and occasionally before it is out of blossom. Of course, fruit should never be packed for market when it is damp from rains or dew.

Many fungus diseases of leaves and fruits can, in a great measure, be held in check or prevented by spraying with copper fungicides.

I have brought with me a number of photographs of pear trees sprayed and not sprayed to show the beneficial results obtained by the use of fungicides (see photos). Fungicidal sprays have also proven most beneficial in combating apple and pear scab and grape rot. Fully 90 per cent. of our grapes can be saved by a proper course of spraying (see photos).

The Best Fungicides.—Copper compounds have proven best. Bordeaux mixture, though somewhat more difficult to prepare and use than other fungicides, has thus far given most general satisfaction. It not only prevents the spread of fungi by destroying the germinating spores, but also seems to promote a healthy condition of the plant. The lime holds the mixture to the leaves and is not easily washed off by rains. It is best made according to the following formula: Dissolve six pounds sulphate of copper in five gallons of water over night. If in a hurry use hot water. Pour this into a barrel with fifteen gallons more of water. Slake four pounds of good stone lime in six gallons of water. The slaked lime is then to be added to the copper solution until the sulphuric acid of the latter is just neutralized. In order to tell exactly when enough lime has been used, make a strong aqueous solution of yellow prussiate of potash, which can be purchased at any drug store, and add a few drops from time to time; as long as there is copper sulphate in the mixture it will produce a chocolate brown coloration, but as soon as enough lime is added it will cease to give this coloration; when this point is reached no more lime, or but very little more, should be added, because the mixture becomes more and more difficult to spray. It should then be strained through wire gauze or coarse sacking and is ready for use. If this mixture stands for a while it forms a sediment and must be well stirred before use, and also frequently during use so that the pump may not become clogged. In the preparation of this mixture two or three points must be borne in mind: (1) straws, chaff, sawdust, etc., will not spray, and the water used must be free from such substances; (2) the copper sulphate will dissolve more readily if it is suspended in the water; (3) the mixing and straining should be carefully done so as to have no lumps in the mixture and as little sediment as possible. It is best to make it as needed. The sulphate of copper should be bought in quantity and ought not to cost over five cents per pound.

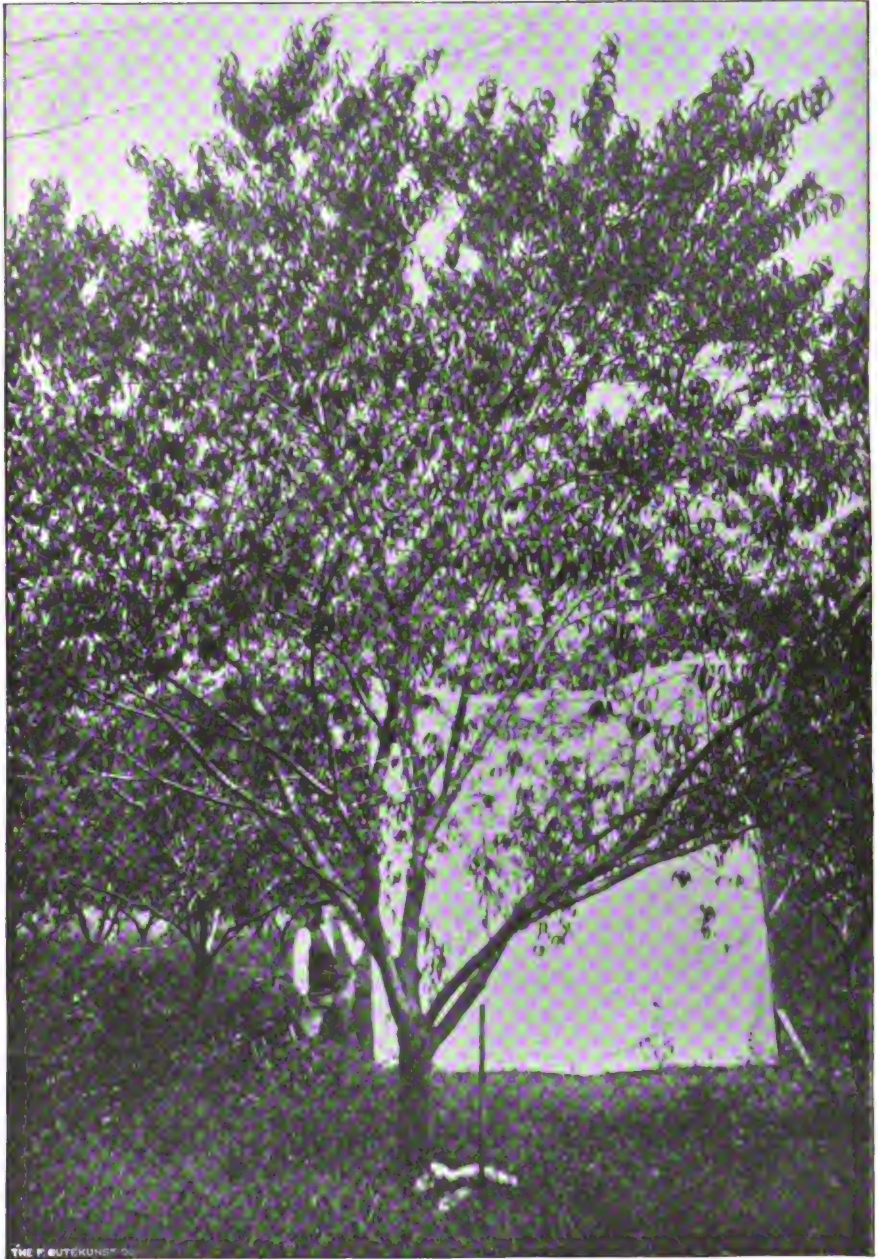
When to Spray.—For apple scab the first application should be made very early, that is, soon after the leaf buds have opened. The second spraying should be done when the trees are in full blossom, and the third when the fruit is about the size of peas. When the weather is hot, with frequent rains, a fourth application should be made. Grapes should have several applications, commencing when in bloom and following once or twice later. If the weather is dry and cool it is not necessary to spray so often as there is not much tendency to rot, but heavy dews are as likely to induce rot as rains.

Pumps.—To spray successfully we must have a good strong force pump, with a nozzle that will throw a fine spray. The last is very important, for otherwise the fungicide will be wasted and the expense of spraying largely increased, and the foliage and flowers may also be injured. It is economy in the end to start well equipped. I think the Vermorel nozzle the best in the market. Mr. Wellhouse, of Kansas, has a new nozzle, claimed to be superior to anything ever offered, but it is not yet on the market. The Nixon nozzle is a good one for some purposes, but will not do for the thick Bordeaux mixtures. The "Graduated" and "Boss" nozzles have not proven satisfactory.

In conclusion I would say this whole question of the treatment of



II. PEACH YELLOWS.
(Blossoms and leaf buds opening in October).



III. PEACH YELLOWS.
(The first year, symptoms on the base of two right hand branches).



IV. PEACH YELLOWS.

(The first year, symptoms in the top of the tree at right and left hand).

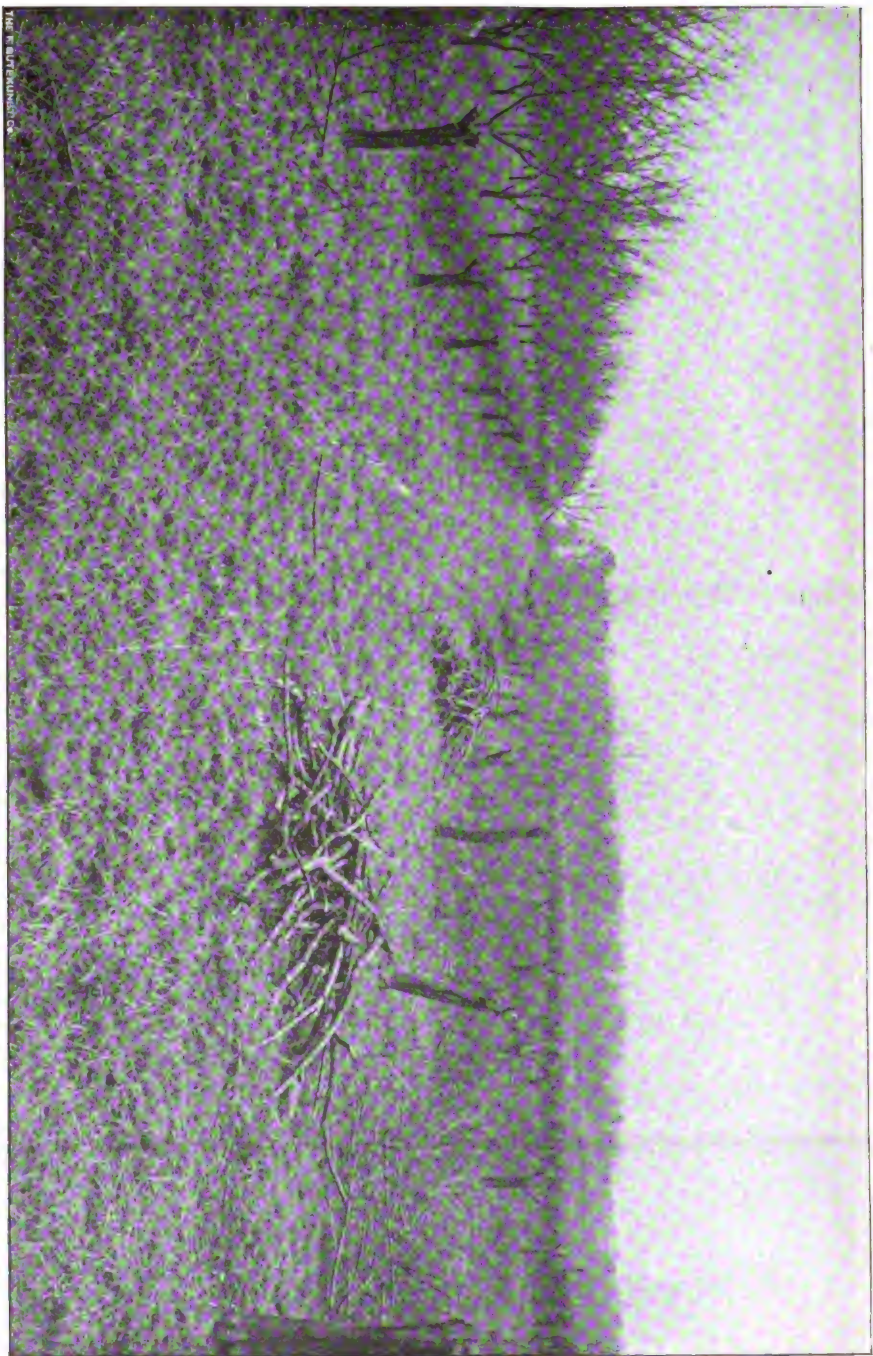


V. PEACH YELLOWS.

(The second year, symptoms on all parts of the tree)..



VI. PEACH YELLOWS.
(Third or fourth year, whole top dead).

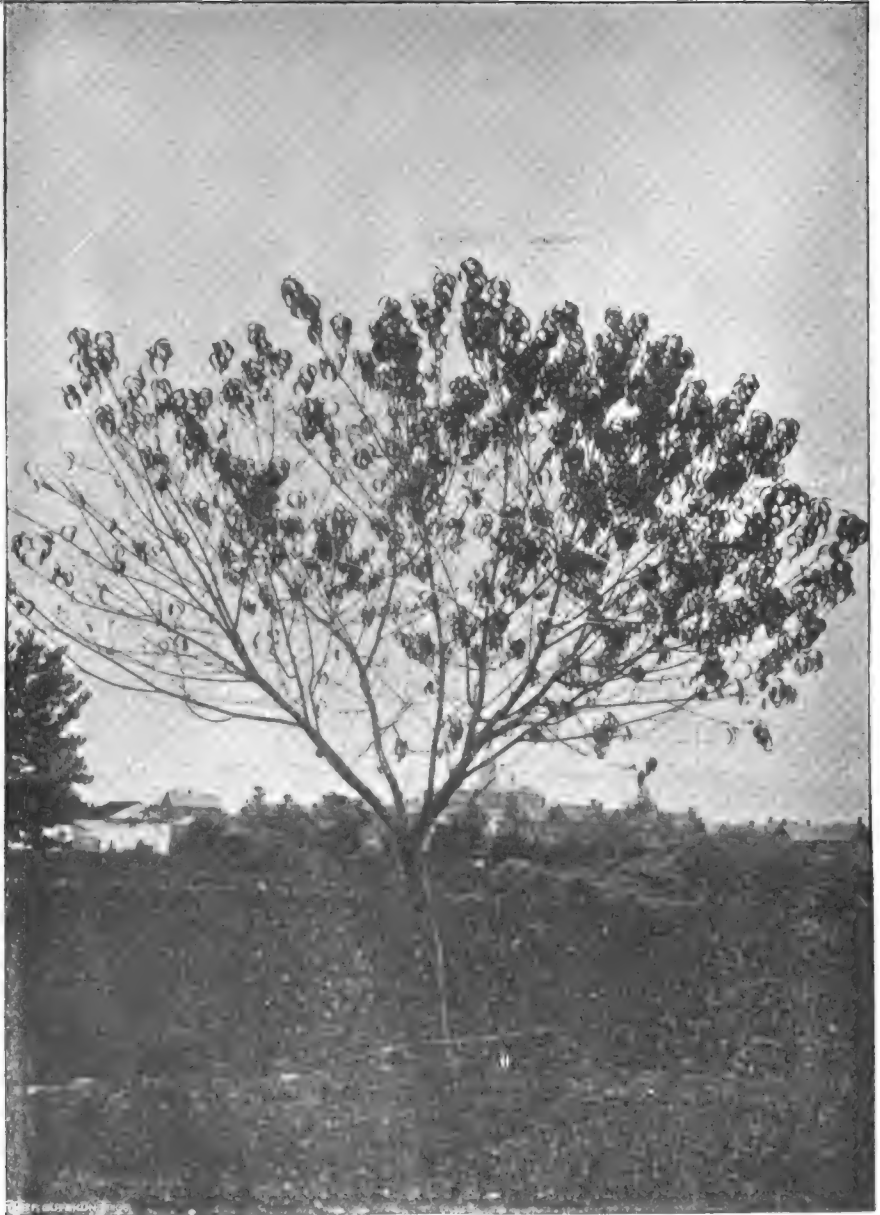


VII. PEACH YELLOWS.
(Destruction of a young orchard).



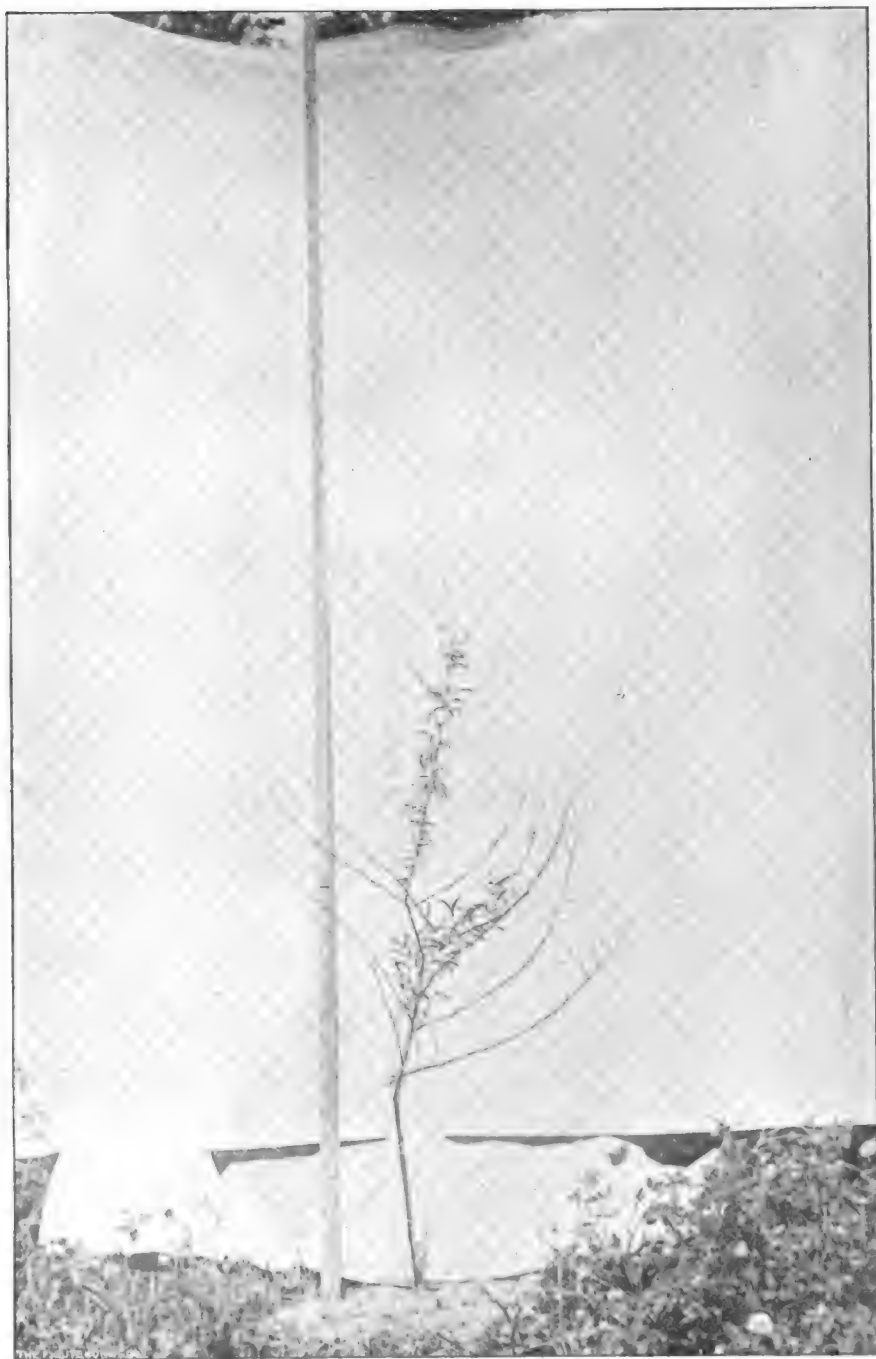
VIII. PEACH YELLOWS.

(One of a row of heavily fertilized trees, nearly one-half of which became diseased the same year).



IX. PEACH YELLOWS.

(Healthy tree from an untreated row adjoining No. VIII). These trees contracted Yellows less rapidly than the heavily fertilized ones.

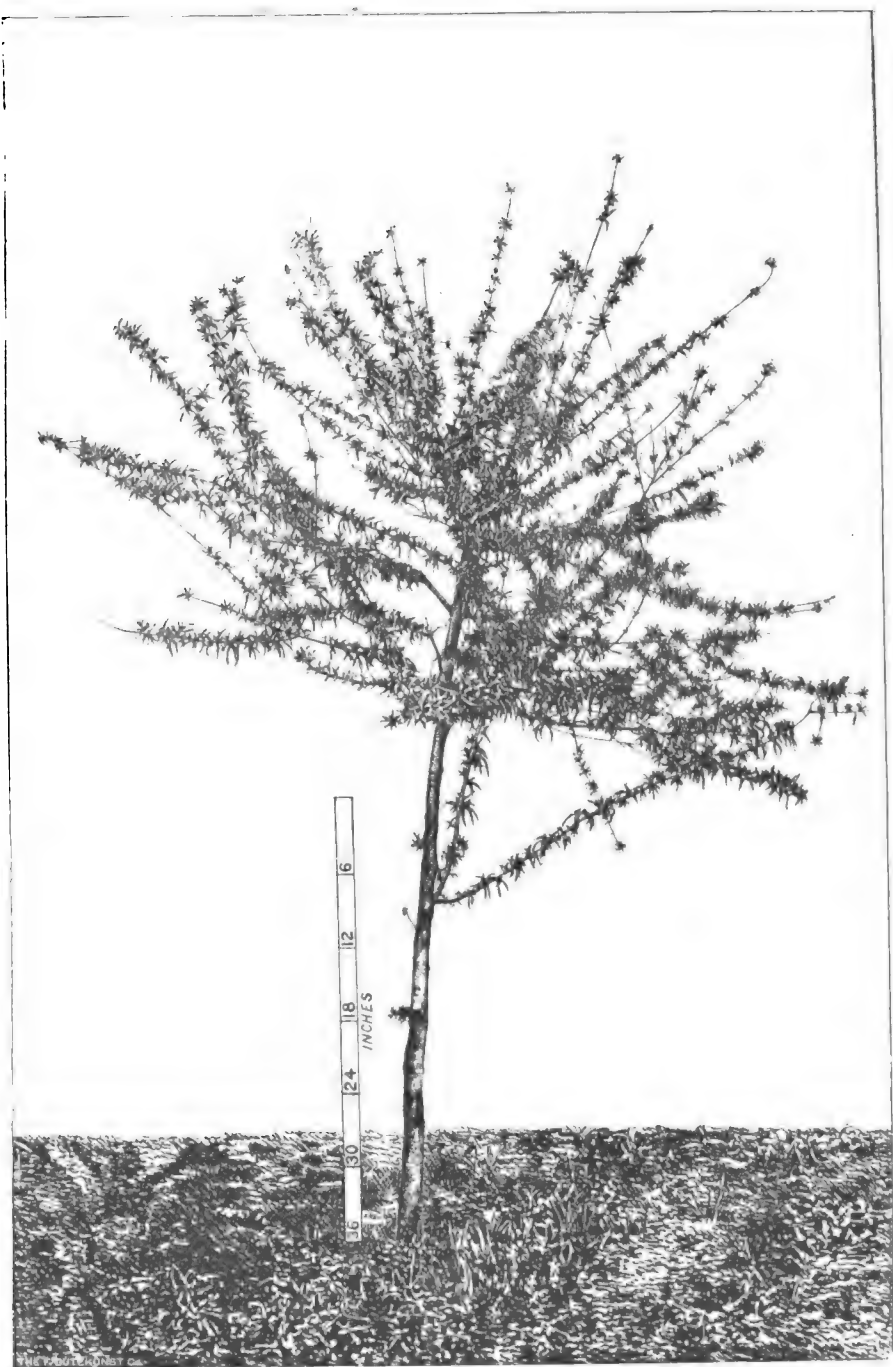


X PEACH YELLOWS.
(Result of a bud inoculation). Tree three years old.



XI. PEACH YELLOWS.

(Healthy unbudded tree for comparison with No. IX. Same age and from same nursery).



XII. PEACH ROSETTE.
(Symptoms appeared in early spring and Photo was made in June).



XIII. PEACH ROSETTE.

(Ordinary appearance of a diseased branch a few months after the first symptoms appear).



XIV. PEACH ROSETTE.

(A single tuft enlarged to twice natural size, and with most of its leaves removed so as to show manner of branching.)



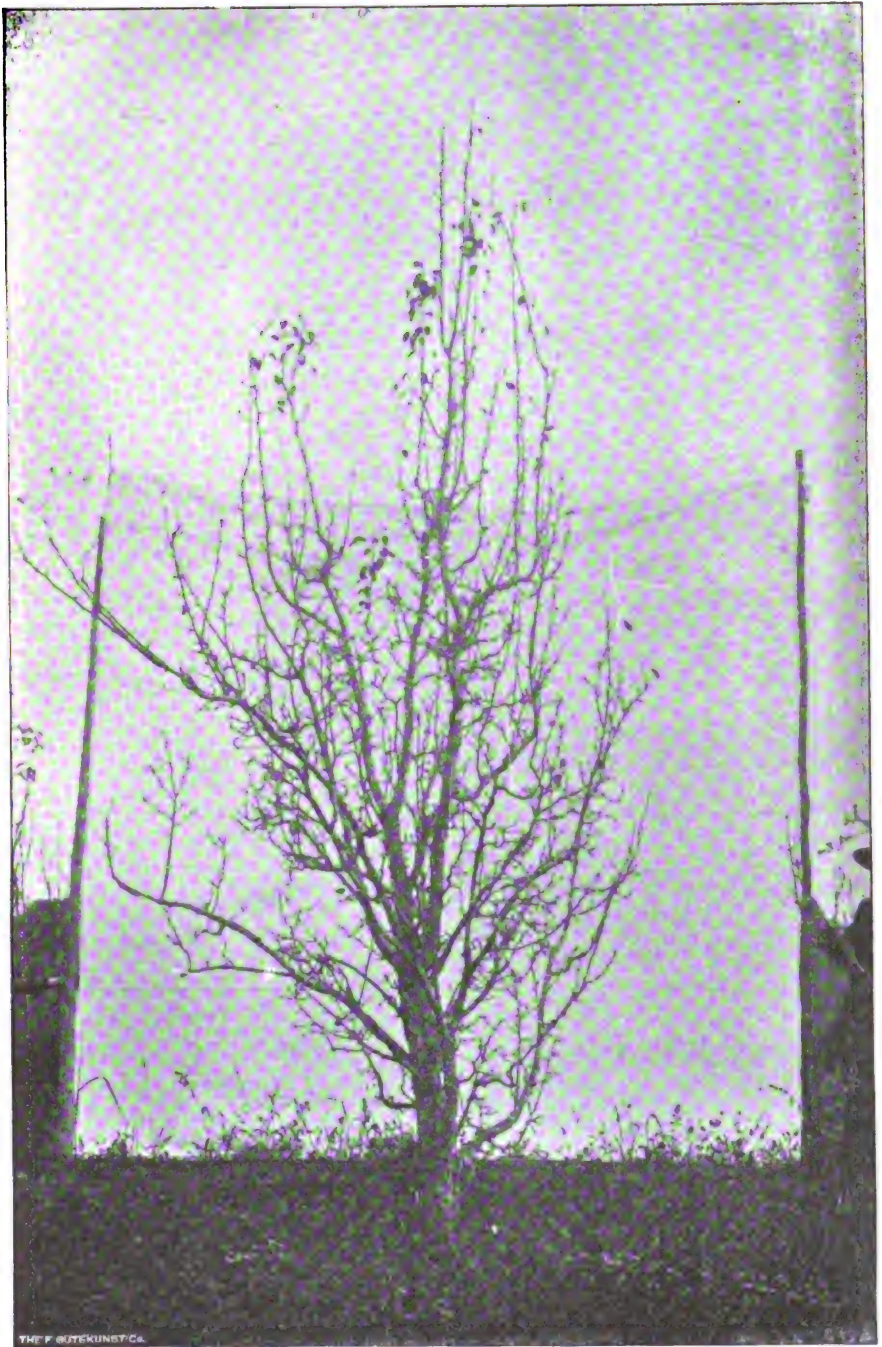
XV. PEACH ROSETTE.

(Result of bud inoculations,—same season, *i. e.* in 4 months, 12 days.



XVI. PEACH ROSETTE.

(Result of bud inoculations,—second season, *i. e.* in about 12 months).



XVII. PEAR LEAF BLIGHT.
(Unsprayed—Old Dwarf Duchess.)



XVIII. PEAR LEAF BLIGHT.
(Sprayed—Old Dwarf Duchess).

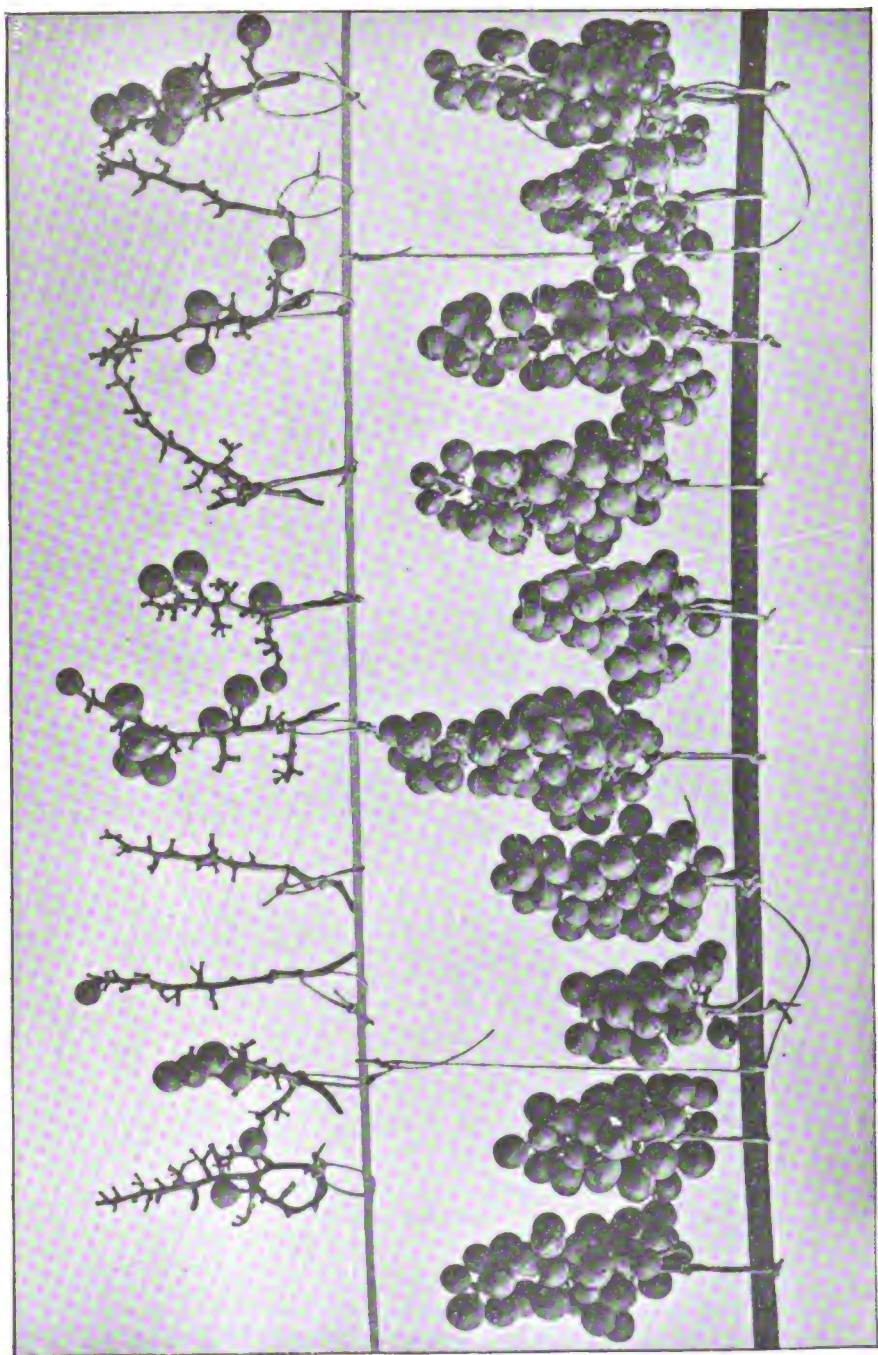


XIX. PEAR LEAF FLIGHT.
(Unsprayed and sprayed.—Young Bartlets).



XX. GRAPE ROT.

(Best unsprayed and average sprayed—nearly every cluster like this).



XXI. GRAPE ROT.
(Early treatment and no treatment.)

plant diseases is yet in its infancy, and the next fifty years will probably witness many and great advances. The farmer and fruit grower must wait patiently, and I have no doubt the plums will drop into his baskets.

A few words in reference to peach rosette, which one gentleman here thinks he has found in Pennsylvania. Thus far it is known only in South Carolina, Georgia and Kansas. It is rapid in its results, and trees generally die in six months and always inside of two years. In Georgia it is very serious, and is well established in many counties, at least twenty. The rosette is readily transmitted by bud inoculation. There are no premature fruits. The symptoms generally appear in the early part of the season and are well represented on the accompanying photographs.

Prof. Heiges. What are the first symptoms of fire blight in the pear?

Dr. Smith. The blossoms or leaves of one or more branches suddenly wilt, and in a few days the flowers, leaves and stem turn black. When large limbs are attacked the greater number of leaves and fruits are not infested with the germ, but shrivel from loss of water, the blight having encircled the branch lower down. Often gum exudes from the blighted stem or fruit. This gum is made up of bacteria and the broken down tissues of the plant, and anyone can satisfy himself of its contagious nature by pricking a little of it into a young fruit or the tip of a very vigorously growing shoot.

The following from the "Query Box" was addressed to Dr. Smith: "What is the black, needle-like spore found on cherry and plum trees affected or about to be attacked by black knot."

Dr. Smith. I do not know from the brief description given what it is, but do not think it has any connection with black knot. Possibly the writer has in mind a little fungus known as *Cornularia*, which often occurs on the branches of peaches, plums, and cherries in such quantity as to give them a bristly feeling.

ILLUSTRATIONS.

XII—Peach Rosette. Appearance of a Georgia tree in June. All of the foliage is bunched into rosettes. The preceding year it looked as healthy as No. XI.

XIII—Peach Rosette. A very characteristic branch, showing details of the rosettes.

XIV—Peach Rosette. Enlargement to twice natural size of one of the compact terminal rosettes. This has been stripped of several hundred small leaves, so as to show the branches. The actual length of this shoot was only two and seven-eighths inches, whereas terminal shoots on healthy trees made a growth of one to two feet.

XV—Peach Rosette. Result of bud inoculations; same reason. Right hand branch diseased, left still healthy. The buds were in-

serted into the base of the seedling at the points indicated by the white spots. Tree budded June 21. Photographed four months, twelve days later.

XVI—Peach Rosette. Result of bud inoculation; second season. One hundred and thirteen out of one hundred and nineteen trees became diseased, as shown here, in one year from the time the buds were inserted. Several thousand unbudded trees in the same nursery remained healthy.

XVII—Pear Leaf Blight. Old dwarf Duchess denuded of its foliage in summer by *Entomosporium maculatum*.

XVIII—Pear Leaf Blight. Old Dwarf Duchess sprayed several times with Bordeaux mixture. Foliage uninjured by the fungus and fruit spurs well developed for the next season. Experiment of D. G. Fairchild.

XIX—Pear Leaf Blight. Young standard Bartletts. Left-hand tree denuded of its foliage in summer by *Entomosporium maculatum*. Right-hand tree sprayed three times with Bordeaux mixture. Experiment of D. G. Fairchild.

XX—Grape Rot. One and two, best clusters from untreated plats. Three (right-hand cluster), an average bunch from the treated vines. Five sprayings with Bordeaux, and nearly every bunch like this. Experiment of B. T. Galloway.

XXI—Grape Rot. Upper row, early treatment with Bordeaux mixture, full strength; lower row, no treatment. Average bunches from each plat. Experiment of B. T. Galloway.

Mr. Hiester. I am much interested in spraying and will briefly give you the result of two years' experimenting by a greenhorn:

For several years the vineyards in our section have suffered greatly from the ravages of "black rot" and "mildew." In 1890 I lost nearly my entire crop of grapes, harvesting less than two tons from 1,500 vines. The whole crop did not net me over \$150.00. I learned from the various "Experiment Station Bulletins" that Bordeaux mixture and the ammoniacal solution of carbonate of copper, if properly and persistently applied, would prevent rot and mildew, so I determined to give them a fair trial before digging out my vines.

In 1891, as soon as the leaves burst, I sprayed with Bordeaux mixture, followed with another application two weeks later, this in turn was followed at intervals of ten days each by three applications of the ammoniacal solution. As a result I had, in 1891, nine and one-half tons, which netted me \$635.00. The total cost of spraying was \$15.72.

In 1892 I again sprayed (as before) and the yield was nine tons. The falling off in yield from 1891 was caused by my failure to fertilize properly. I believe that barnyard manure is the best fertilizer we have.

Some years ago my brother and I planted apple orchards on adjoining farms. Varieties and growth of trees were similar in both. In 1889 I concluded to spray as a protection against the codling moths and apple scab. I sprayed the trees thoroughly just after the blossoms fell with Paris Green (1 pound to 200 gallons of water).

I made an application about ten days after of Bordeaux mixture and Paris green (2 ounces of Paris green to 50 gallons of mixture), and later on sprayed with ammoniacal solution. My brother's orchard, being then in the hands of a tenant, was not sprayed. While he had not a bushel of perfectly sound apples, I picked a thousand bushels. In 1891 I again sprayed my orchard and picked 1,500 bushels, while the apples on the other farm were a failure as they had always been. The cost of spraying was about two cents per tree for each application. For apple scab I use the ammoniacal solution made after the following formula:

Five ounces carbonate of copper,
One pound carbonate of ammonia,

dissolved in one quart of water and well mixed, and the whole stirred into a barrel of water.

Thos. J. Edge, Secretary of the State Board of Agriculture, gave a very interesting and practical talk on "Fertilizer Brands and their Meaning." Being illustrated by numerous charts, giving tables and analysis of different fertilizers, no report of the address was made.

While Mr. Edge's remarks were in progress, Governor Pattison entered the room. The speaker at once yielded the floor to the Governor, who, having been presented by President Moon, spoke substantially as follows:

Mr. President and members of the State Horticultural Society of Pennsylvania: I am much pleased to meet with you and to have an opportunity of saying a few words to your association. Your Horticultural Society, like other similar organizations, is of great importance, as it represents vast and growing interests in our State. It is only by meetings like this that you are brought together and engage in discussions that must be of interest and advantage to all who attend. I can safely say that the agricultural interests of Pennsylvania are more actively promoted by the quarterly meetings of our State Board of Agriculture than by any other means.

In connection with your Horticultural Society, I am extremely anxious to have Pennsylvania make a creditable display at the World's Fair. It seems difficult to arouse an interest in this matter such as its importance demands, until the time is upon us, when it may be too late. If at Chicago our State is not properly represented in all her varied resources, our citizens will have cause for complaint. We have great agricultural and horticultural interests in our Commonwealth, and I hope to see our State the greatest in many respects in the Union, and second to none in the number and variety of her farm products, fully and creditably represented. To accomplish this will require active and unselfish effort, and I trust satisfactory arrangements will be made to secure your hearty co-operation and assistance. We look for early legislation to provide funds for a proper exhibit at the World's Fair. Such legislation, I regret to say, is too frequently subordinated to legislation of a special character. By way of illustration, I need only call your attention to efforts to secure proper quarantine laws. Such laws concern the whole public, more especially when we are threatened with an invasion of the cholera during the coming summer, and yet it seems impossible to secure the consideration which the subject demands, while bills for special purposes are hurried through at a

remarkable pace and almost without opposition. Several other important subjects are treated in the same indifferent way. I trust, however, this will be remedied in the near future.

Let me urge your interest in the horticultural display of Pennsylvania. We desire it to be one of the most complete at the Columbian Exposition. If the people of the State are thoroughly aroused I have no doubt as to the result.

Adjourned.

AFTERNOON SESSION.

President Moon called the members to order at 2 p. m., and stated that the first business in order would be the selection of a place for our next annual meeting.

Judge Stitzel. This society has met in Reading three times, and its meetings there have always been successful. It is now some seven or eight years since our last meeting there, and if favored with the next I think our members will have no occasion to regret it.

Mr. Engle. I have no special preference further than the best interests of the society. We have always had good meetings at Reading, and if no other place is proposed, we will, of course, accept the invitation without a vote.

Mr. Fox. I can promise you that our city will extend a most cordial welcome, and our facilities for accommodating you are better now than when you last met there. We have enlarged and improved our hotels and court house. We hope, also, to be able to receive you in our new Board of Trade rooms, and though you come in the bleak mid-winter, you will find the hearts and homes of our people warm for your members.

There being no contest, Reading was unanimously selected for our next place of meeting.

A vote of the members having been taken, it was decided to hold no evening session.

The following paper was read by the secretary:

MY EXPERIENCE IN CHESTNUT CULTURE.

By J. T. SMITH, *Swales, Pa.*

In the fall of 1884, while at the fruit farm of H. M. Engle & Son, Marietta, Pa., we saw the Paragon chestnut growing on their farm, and being highly pleased with it we made some inquiry as to its cultivation. Mr. Engle informed us that it could be grown on sprouts of

our common chestnut. We concluded to try it in a small way. Having about three acres of scrubby chestnut timber on a hillside too stony to be farmed with any satisfaction, in the spring of 1885 we chopped off the timber and left the chestnut sprouts grow two to each stump, keeping all the rest off. In the spring of 1886 we had Mr. Ezra B. Engle, of Marietta, to graft these sprouts two to each stump where we had two sprouts suitable for grafting. About 85 per cent. of the grafts grew nicely.

The grafts made from two to three feet of growth the first season. We supported most of them by tying sticks along main stem and up along grafts, using sticks about 2 1-2 feet long for this purpose. In 1887 a few of the grafts bore some chestnuts, but this should not be allowed. This early bearing broke off some of the grafts, the weight of burrs being too much for the young grafts. Where there were two grafts or trees to a stump we cut grafts from the one, and since have removed them altogether, leaving only one tree to each stump. We also grafted small trees that come up over this ground where they were needed to give us a full orchard, and they succeeded just as well as on the sprouts, only not making quite such strong growth. Our trees have been bearing good crops every year since they are large enough to bear.

We have had no trouble to get \$6.00 per bushel for all the chestnuts we have raised so far.

It is considerable of a task to keep sprouts and underbrush down on a piece of ground like ours, but if brush and sprouts are well kept down the first few years, as the chestnut trees get larger this work becomes less of a task. A drawback to this business is the chestnut weevil or the worm; the fat, greasy little fellow comes in for his share. But with all this, we are of the opinion that this business, when it becomes a business once, will be profitable. There are thousands of acres that could be used for this purpose that are, in a manner, useless for anything else. The trees are hardy and we think will be long-lived, and as they grow older and larger will become more profitable. As to the market for the nuts, we do not feel the least alarmed that there will be an overproduction, as the natural chestnut is annually getting scarcer as the forest is being chopped out. Along quite a number of our mountains there are railroads, and these mountains are almost annually burned over, and that keeps young chestnut timber from coming to any age. We would like to know whether anyone has had any experience in spraying the chestnut to kill the weevil or worm and with what mixture, and when and how often this should be done. Sorry I cannot be with you to hear these questions answered.

Mr. Bartram. In reply to Mr. Smith's inquiry about spraying chestnuts, I have never had any experience in that direction, although I have grown them for some years. I have one tree that, until a few years ago, always had many wormy nuts, while another tree nearby had none. I would like to ask Mr. Engle how Mr. Smith's trees were grafted.

Engle. They were tongue grafted. As to the worm or weevil to which the essayist refers, we have had some trouble but not of a serious nature.

Have never tried spraying.

Also started a chestnut orchard on mountain sprout land, and the prospect is promising. I have no fears as to its ultimate success.

WORLD'S COLUMBIAN EXPOSITION.

Mr. Moon, chairman of the committee appointed to confer with Mr. Woodward, stated that they had a conference with that gentleman which was very pleasant and satisfactory. Mr. Woodward assured us that he will gladly co-operate with and aid us in making an exhibit. Although there is not now sufficient space in sight every effort will be made to secure more. Mr. Woodward is present with us and I hope he will let us hear his views in the matter.

Mr. Woodward. I am grateful for an opportunity to make myself understood. I want to assure you that every effort will be made to secure additional space and afford facilities for a first-class exhibit. It is unfortunate that there should have been any tardiness in the preliminary work, and that so much valuable time has gone by, but that shall not stand in the way of making a display.

My relation to this work is very recent. I have only during the past few weeks been made Deputy Executive Commissioner. I said to your committee this morning that the question of space was not in the hands of our committee. It is entirely in the hands of the World's Fair authorities at Chicago. At first 312 square feet were allowed for our exhibit. Now we are allowed 800 feet, and I have just read a letter from Chief Samuels offering, under certain circumstances, to allow 1,500 and possibly 2,000 square feet.

The arrangement as now proposed is that your society will appoint an expert to collect and pack your exhibits. Provision will be made to pay expenses so far as our limited means will allow. It would be well to select some central point to which all exhibits should be sent and properly arranged before shipment to Chicago.

Mr. Butz. Will individual exhibitors or contributors of fruits, etc., be required to pay expenses to central office?

Mr. Woodward. It seems to me that exhibitors should deliver their exhibits to certain points as agreed upon.

Mr. Moon. In other States fruit is being collected and forwarded to certain points preparatory to being sent to Chicago.

Mr. Woodward. This is different from all exhibitions of the kind ever held, and one of the most important things will be to economize space. It will be an exhibit of quality rather than quantity. There is no department but that has now applications for 100 per cent. more space than can be granted.

Mr. Fox. Upon 1,500 square feet of space, by using the pyramidal form, 5,000 plates may be exhibited. This would make a creditable display, but I hope the amount of space may be largely increased.

Mr. Engle. I think the matter of an exhibit at Chicago looks more favorable now than it did yesterday, and that it had better be left in the hands of a committee with full power to act for and in behalf of the society.

A motion to this effect was subsequently made by Mr. Engle and unanimously adopted. The following constitute the committee:

W. H. Moon, Chairman, H. A. Chase, Geo. C. Butz, Calvin Cooper, W. P. Brinton.

The following paper was read by Mr. Jamison, of Juniata county:

THE PEACH CROP OF 1892 AND ITS LESSONS.

In making up the sum total of the peach crop of 1892, considered with 1891, we find by actual figures, based on estimates from our most worthy and practical growers, that the crop of peaches of 1892 was scarcely one-fourth of a crop. On the Delaware peninsula and the eastern shore of Maryland, according to the best estimates of some of the best growers, it was scarcely one-tenth of a crop. Some of the growers about Edgmont estimated the crop there at one-half to one-fourth of a crop. In the Juniata valley, by actual figures, it was one-third, and many other places almost an entire failure. Taking the crop of 1891 to have been the largest that was ever raised in the United States and, according to some of our best estimates, to have been from 5,000,000 to 7,000,000 baskets, and comparing the crop of 1892 to that of 1891, and it was less than 2,000,000 baskets. And I think if we could get the accurate figures, it would not reach 1,000,000. Yet, in the face of all these figures, prices in New York, Philadelphia and Baltimore, comparatively: In some instances good fruit selling as low as 60 to 70 cents per basket, and 70 to 90 cents per crate, while in Pittsburg the prices were considerably better, ranging from \$1.00 to \$2.75 for extra fine fruit. Now, the query arises to us fruit growers, why did we not obtain better prices for our fruit? And this is something that should engage our attention, and if possible we should try and avoid it another season. About the average price obtained in Juniata (net), I don't think would reach \$1.00. In some instances orchards averaged as high as \$1.20 per crate, but for every one that reached a dollar and over, there were three that would not reach a dollar. The peach crop of last season should have netted the growers from \$1.50 to \$2.00 per crate, and I am free to make the assertion, if it would have been wisely and judiciously handled, it would have reached that price. Now, what is the cause and what the remedy and what the lesson taught? The answer is simply this: The growers allowed the dealers to make their prices.

Dozens of commission men, weeks before the fruit was in the market, were traveling the country over soliciting shipments, and as a general thing those men were nice, oily-tongued talkers, and, as a result, made the average fruit grower believe that they were the men that could handle their fruit to the best advantage. Now, let us look for a moment to the workings of some of these commission men handling our fruit, and then we can, perhaps, be more able to judge. In the first place, the men representing those houses are paid from \$15 to \$20 per week and expenses, say one dollar per day, making \$7 more, horse hire and traveling fully \$15 more, making \$37 to \$42 per week, to say nothing about boot blacks, drinks over the bar, Havana cigars, &c. Now it is an old saying that "money makes the mare go," and people don't work for nothing, and the man that represents a commission house must be paid; and, as a matter of course, the grower must foot the bill, if not directly, indirectly. Then again I, as a grower, ship from Mifflintown and ship a solid car load of peaches, say 400 crates. My neighbor from Port Royal ships another car, and other shippers send in their cars from Thompsontown, Edgmont, two or three from the Delaware district, and still some more from the eastern shore of Maryland, making ten cars of peaches for tomorrow morning for one

commission house to handle. Well, those peaches must be sold; they are perishable stock and the people know this, and in order to sell this fruit it is slaughtered, or, in other words, sold at half price, bringing in more middlemen, and they must be paid by the producer, of course. It is not hard to see in this case why the grower gets little John's share. This case really happened in one of our large cities last season. Then again, we growers put our own fruit in competition. But one will say, "How is that done?" That is very easy to do. A gentleman from our county happened to visit Philadelphia last season in the height of the peach season, and when he returned he told me some of his experience, and that he saw lots of Juniata fruit in market, and he thought we might learn a lesson from it. Telling him I am always glad to learn, he said: "In the first place you men put your fruit in competition by shipping to too many houses, and some not reliable ones. For example: Mr. A. runs a commission house, next is Mr. B, next is Mr. C, and so on, perhaps, eight or ten or twelve houses handling peaches. One ships to Mr. A, another to Mr. B, some one else to Mr. C, and still some one else to the rest of the houses, and they all handle your Juniata county fruit. Now, a customer going out to buy some peaches soon sees that the market is well supplied, and is going to buy where he can buy the cheapest. The first house he comes to he prices the fruit; \$1.50 per crate; next house, \$1.75. "Won't you take any less? I can buy the same fruit down yonder at \$1.50." He studies a moment and replies: "Well, if he can sell at \$1.50 I can sell for \$1.25;" and so it goes. Then this is not yet the worst side of the affair. If the grower would just get what his fruit sold for; but so often the amount is cut short from one to five crates, and then sometimes the prices cut short from 5 to 10 cents per crate, and poor fruit often goes to sell good fruit." Now, these are some of the reasons our fruit brought such short returns. Then, again, three-fourths of all the peaches were shipped to commission houses in Philadelphia and Pittsburgh, while smaller towns like Johnstown, Greensburg, Connellsville, Bedford, Uniontown and a hundred more in Pennsylvania, scarcely saw any peaches at all, and what few found their way there sold at \$1.50 to \$2.50 per crate.

One man from one of the small towns in Pennsylvania wrote to me for a crate of peaches, saying they were selling at \$2.50 per crate and not to be had at that price. Again, in the midst of the season a dealer came from one of our western towns to buy peaches. After looking around for some time he commenced to buy at ninety cents per crate, but finding he was not getting as many as he wished, he paid another party \$1.25 per crate, shipped them to his home at an additional cost of nineteen cents per crate, and sold them at \$1.75 and \$2.00, leaving a handsome profit of 66 to 56 cents per crate—almost as much as the grower received for his fruit. Now, the reason is plain and the growers are to blame that we did not receive a better price for our peaches. The causes are, first, considerable surplus of canned and evaporated fruit from the heavy crop of 1891; second, too many salesmen cutting each other on prices; third, shipping too many to commission houses in Philadelphia and Pittsburgh and neglecting the smaller inland towns; fourth and last, no organization of the growers. The remedy? If asked once during the shipping season, I believe I may safely say one hundred times or more, was I asked, "Why is it that peaches are so

poor a price, and you men all say there is a short crop?" My answer is, simply, one man or a few organized can do much more than fifty or one hundred with no organization. Now, I would say that had all the growers been organized under one head, all the marketable peaches could have been sold for \$1.25 to \$1.50 and upwards, f. o. b., at Mifflintown.

Now, the lesson taught is simply this, if the growers would organize they could make their prices and not let other parties make them for them. I would say, for one, first, last and always, "organize."

Mr. Cooper, chairman of Committee to Audit Accounts of Treasurer, reported the statement correct and showing in his hands a balance of \$212.82.

On motion report was accepted and committee discharged.

The following were appointed delegates to the annual meeting of the State Board of Agriculture:

S. B. Heiges, chairman, Cyrus T. Fox, H. C. Snavely, H. M. Engle, E. W. Thomas.

The following paper was read by Hon. W. R. Barnhart, Greensburg, Pa.:

FRUIT CULTURE.

Notwithstanding the fact that there is no kind of food that is more relished by, and more conducive to the health of the human family than fruit, in looking around in this State and in every other state of this great country of ours, we cannot but notice the inexcusable carelessness and indifference of (I will say) the majority of our people in regard to the production of fruit. We see people who own homes that plant few if any fruit trees. We also see people who own fine, large farms, but who are careless in planting and taking care of fruit trees, even if they have interest enough to plant at all, showing no interest whatever in fruit culture. We have hundreds and thousands of rich old men, with fine, large farms right around and amongst us, who never did nor never will appreciate the fruit adapted to our country and climate. When they might have it in abundance in their own garden and orchard, they do not even know how to appreciate the apple.

Not taking into consideration the many other important fruits of various kinds, do we not all know that we have many people that can partake of a dish of berries, a basket of grapes, peaches, cherries, pears, plums or apples with a relish that you would think that they never saw such delicious fruit, and they are surprised when you tell them of the abundance of such that grows on a small lot of ground. They are also surprised to learn of the place such fruit supplies on the table during such a long season of the year, in its original or raw state. What is as good as a dish of nice, cultivated berries—strawberries—such as my friend Calvin Cooper sets before you, or our best raspberries or blackberries of the different early and late varieties. Why, such a dish, with sugar and good cream, is good enough to feast a king. During the heated term, in last harvest, when I had no appetite from

overwork and heat, I could always enjoy such a dish. We can have such a diet for several months of the year, and I ask you, is there anything more desirable? Cherries (cherry pie), for six to eight weeks and who amongst us does not relish the cherry? Peaches, the most beautiful as well as the most delicious fruit that grows. How beautiful and delicious. To describe the peach, you think of the most beautiful female you know, and say as sweet and as pretty as a peach. We can have this fruit one-fourth of the year, pears for nearly one-third of the year, beginning with the best early medium and late autumn; or, counting the winter for one-half the year, apples almost all the year (at least ten months in a good apple year), beginning with best early, medium and late, and the long keepers. These same people neither know the difference between a Northern Spy and Ben Davis. Nor do they know the Bartlett or Seckel from a common pear. Fruit culture, I claim to be the finest or the finishing accomplishment of the American farmer today, and fruit of different kinds, manufactured or in its raw state, the finest or the finishing of the meal. I don't count the man a finished or complete farmer that don't cultivate fruit, and, if need be, a taste for fruit (especially the fruit adapted to our climate).

Fruit culture and fruit consumption, I think, is yet in its infancy in this country. We all know that the more good, healthy fruit people use, the more they cultivate a taste for, and the more they want to use. We frequently hear people say that they would much rather buy fruit than medicine for their families. The demand for fruit amongst the masses is growing rapidly. Surely we need not fear of raising too much first-class fruit of all kinds. We will have a market for it all the time at some price. People want fruit to bring up good, healthy boys and girls. The more good fruit the less medicine, and the better health of the family, is a true saying, I believe, as we see this in the homes of the people who use plenty of fruit when it can be secured. Fruit culture has its many drawbacks, of course, under the most favorable circumstances. The first important point is the selection of ground or soil or site for the fruit garden or orchard. This is of much more importance than is generally supposed by many. Select the highest and best dry ground (sandy or generally light soil preferable to heavy clay or limestone soil for nearly all kinds of fruit). Select away from the creeks or creek bottoms as far as you can. This is an important point for the late spring fruits. With an eastward slope, if possible, and make the soil real deep and rich with the plow and plenty of lime and manure. We cannot get our light, sandy land too rich to grow choice fruit. The richer this kind of soil the better the fruit. Grapes, peaches and berries are much sweeter and better on rich, sandy soil than limestone soil with us in western Pennsylvania. We have as many or more drawbacks to contend with in fruit culture than in almost anything or everything we undertake. First, the short time the peach tree will last with us. We must keep planting all the time if we would succeed with this fruit. Several crops and our peach trees are dead. The peaches in the garden of sunny Italy are simply perfection in the fruit line. Our visit there during peach time some four years ago did satisfy me beyond a doubt that of all the counties we passed through, all of which had more or less of the most beautiful, fertile soil, yet we think for fruit the garden of Italy surpasses them

all. Had we some States like the garden of Italy, with their climate and rich soil, and our surroundings, we certainly would have a paradise here in this country.

Next, the black knot on the plum and some varieties of cherries. This is something we can contend with but we cannot get rid of. We have lost many fine trees in this way, and we have tried to cut and burn all affected branches for years as a remedy, and yet we have the black knot all the time to fear and fight. We have the blight on the pear and quince, which is something hard to understand and account for. Why and what is the blight? It is an insect or is it the result of atmospheric influences? I am not so clear on this being an insect. Why was it that last season, right in the extreme dry, heated term, my whole quince orchard of several hundred trees was blighted all around and over for a foot or so in the ends of the limbs or branches, appearing to have been done in a few days, as though it was by hot air, similar to the hot-air blighting of the corn in some of the southwestern States. Pears with us were much more injured last season than for years past. Trees that had withstood the trial or test for years were, in a few days, blighted all around and many entirely injured. Could this insect (if insect) get in its work so effectively in so short a time?

Our dry, heated term last season was an extreme one, and, perhaps, enabled the pest to work more effectively. The pear blight is a serious question with us, or rather the remedy for the blight. We have had many fine standard (we plant mostly standard) pear trees destroyed with blight during the last twenty years. We know no remedy. We want the wisdom of this meeting on this subject. We keep on planting, so that we partly make up for this calamity, for calamity it is. We think too much of this fruit to give up the contest, especially the Bartlett and Seckel, the two best on the list of this fine fruit to my mind, at least. The Seckel had, heretofore, been nearly blight proof. So far as the quince is concerned, I don't care so much, as it is the most unsatisfactory fruit I have tried to grow, between the blight, winter killing and late spring frost killing. I have about come to the conclusion to give up the quince.

HEDGE VS. WIRE FENCES. WHICH ARE MOST DESIRABLE?

Mr. Cooper. I am not an agent for any fences. If I had my own way there would be no fences at all, but as between hedge and wire fences, I will take the side of wire fences. About three years ago representatives of two companies came into our county to introduce new hedge fences, and promising big things. They received a number of orders, and miles were contracted for. Last summer the first "piashing" or laying down was done. They claimed that by loosening the root and laying down the plants at an angle of about 45 degrees they had the power of checking the growth and dwarfing the plants. I told the agent that I had no faith in his theory, and that he could not dwarf the Osage orange.

Notwithstanding this, I went with a committee to Chester county to see a hedge started on said plan, which was very pretty, and, to my sorrow, with others, I signed a recommendation in favor of such a fence. Since then I am convinced that it is not the fence for Lancaster county farmers.

Recently I have seen a sample of the "Jones Wire Fence," which, I believe, is the best steel wire fence I ever saw. It is made of the best Bessemer steel and the cost almost nominal. It consists of five or six strands of No. 9 steel wire, stretched longitudinally.

Posts are set 16 to 20 feet apart, and four to six uprights wires are locked to the horizontal strands between each of the posts, thus stiffening the fence, that you can climb over it anywhere. The young men who have the control of this fence in our section have taken orders and erected many miles of it, which has given entire satisfaction wherever put up. I am sure it is superior to any live fence I ever saw. The cost of fence with posts 16 1-2 feet apart is 49 cents per rod. Cost of setting, 15 cents per rod.

If posts are set 20 feet apart, the cost would be a few cents per rod less. An Osage orange hedge is pretty when properly trimmed and kent in shape, but this requires much labor. The wire fence referred to has stood severe tests and seems to wear well. Among the greater objections to a live fence is the semi-annual trimmings that are necessary to keep it in good shape, or it will become, instead of a thing of beauty, a great hindrance to the beauty of the landscape, in addition to the destruction of the crops on either side and great detriment of the farm.

Mr. Engle. I have not yet seen the wire fence that is entirely satisfactory. I believe that an Osage orange hedge, if properly trained, will make the most satisfactory fence. It can be made close, strong and durable. I have seen Osage orange hedges trimmed very narrow and still close enough to ward stock. Only when neglected is the fence troublesome and unsightly. I have tried barbed wire, but found it objectionable on account of the danger to animals. There is also some trouble owing to contraction and expansion. For small yards or orchards I would use wire netting.

Mr. Bartram. I have put up 200 rods of the wire fence referred to by Mr. Cooper, and I think it will do well. Have thus far had no trouble on account of frost.

Mr. Fox. I saw the fence spoken of by Mr. Cooper at Mt. Gretna last fall, and I think much of it will be put up next year. I hope we will not abandon well-trained hedge fences. Have seen Osage orange well kept, and it is strong and firm as a stone wall.

Mr. Schwarz. Hedge fences make considerable shade which I would consider objectionable. Wire fences are much more open and easier kept clean. I would like to inquire whether there are any legal fences in this State today. There was introduced in the Legislature today an act making four feet high legal.

Mr. Edge. So far as general law extends there is no legal fence in this State. According to the Act of 1842, division fences are legal if approved by the township auditors, who are by this Act made fence viewers, and their decision is binding unless an appeal is taken to court. The law of 1700 gives us the only definition of a legal fence.

CAN HART AND BIGARREAU CHERRIES BE GROWN IN THIS
STATE WITH SUFFICIENT CERTAINTY TO BE PROFITABLE?

The following in reply to the above question was read by the secretary, and was submitted by Casper Hiller, Conestoga, Pa.:

The cherry crop in late years has become very precarious. I do not think that insect depredation is greater than thirty years ago.

The great trouble now is rot. This is usually attributed to rain, but we do not always have rain, but we have more or less rot all the time. Light colored cherries, Napoleon Bigarreus, Governor Wood, etc., are more subject to rot than the dark varieties, but these, too, rot to such an extent that they cannot be grown with sufficient certainty of success.

The rot is evidently caused by a species of fungus that requires only the ordinary dews of the season to start them into growth. There are, however, occasionally found places where cherries are a success.

These are uniformly found on high ground exposed to the north and west winds.

Theory: But little dew falls here, and that is quickly dried up by the prevailing winds. These elevated orchards can be much improved by a selection of varieties that are least affected by the rot. Noted among these are early purple, Guigne, Conestoga, and Great Bigarreau.

Prof. Heiges. The darker cherries, Black Tartarian, Black Eagle and dark red varieties are nearly rot proof. Light colored cherries are generally liable to rot. We have in York county a variety known as the "Hoke." It is about as large as Black Tartarian and almost same shape. It is a profuse bearer and one of our most valuable varieties. Our county is noted for its large crops of cherries, and I have known as many as 600 bushels to be shipped from York in a single day.

Mr. Engle. In reply to this question I would answer "yes" and "no." There are sections where Hearts and Bigarreus can be grown with profit. York county seems specially adapted to this class of cherries, and some of the western counties also grow them successfully. The "Ida," grown and introduced by Mr. Cocklin, is a light-colored variety that does well. It is as large as "Yellow Spanish," and in quality and productiveness unsurpassed.

Mr. Woods. I have been trying to get our Adams county nurserymen to propagate the Ida. I have many inquiries for it, but it is hard to get. It is easily grown, bears young, and comparatively free from rot, less liable than Black Tartarian. Cumberland seedling also originated by Mr. Cocklin, and is an excellent dark-colored cherry.

Mr. Engle. It is best to grow Heart and Bigarreau varieties on Mahaleb or Mazzard stocks?

Mr. Thomas. I usually grow them on Mazzard stocks and have good success. The tender varieties referred to have not proven a success in our section.

Mr. Hepler. I have raised Gov. Wood and Napoleon Bigarreau only with ordinary success. I have a tree some forty to forty-five years old for which I know no name, but it a constant and heavy bearer and never rots. It is larger than Gov. Wood, light color and a little

tart, with small pit; hangs well on the tree. Those on the outside of the tree can be picked two weeks earlier than those inside. If confined to one variety only would have this.

WHAT ARE THE MOST DESIRABLE PACKAGES FOR MARKETING SELECTED PEACHES, PEARS AND PLUMS?

Mr. Hiester. That depends much upon the market. I think if we can sell direct to the retail dealer small packages of about one-half peck are most desirable.

The Secretary. In the vicinity of Waynesboro our fruit dealers have pretty generally adopted five, ten and twenty pound baskets for shipping their finest peaches. For plums and apricots the ten and twenty pound baskets are almost universally used. For grapes five and ten pound are used. Those for grapes have a solid, flat lid; for larger fruits a raised slat lid is used; they are made with handles convenient for handling quickly, and they can be set six, eight or ten baskets high in cars without shelving by simply placing them by twos, each layer on top of, and at right angles to, the one under it. These baskets cost from four to eight cents each, and are sold with the fruit. They are called "Climax" baskets, and are manufactured in Michigan. They are sold by car loads in our peach belt and are very satisfactory. Another package used extensively there for extra fine peaches is the "Mott Carrier." It is a crate or large basket holding six small baskets of about one-half peck each. They are placed in two layers of three each, with a slatted division between and a cover or lid of veneer over all. They sell at about twenty-five cents. Our growers found that for their finest fruit the small baskets and "Mott Carriers" are the packages that realize the best returns for their fruit.

Mr. Engle. My experience confirms what the secretary has said as to the advantages of using small packages for the finest fruit. Although it requires extra time and expense to ship in small packages, we have always found that the additional price received more than compensated us for the outlay.

WHAT BULBS CAN BE RECOMMENDED FOR EASY WINDOW CULTURE?

Mr. Fox. One of the best is Amoryllis. Japan Lily and Tuberous Rooted Begonia are also easily grown and desirable.

Mr. Rupp. I would recommend Chinese Sacred Lily and Amaryllis.

WHAT NEW FRUITS OR VEGETABLES ARE WORTHY OF FURTHER TRIAL?

Prof. Heiges. Of new vegetables I would name Burpee's Bush Lima, which is certainly an acquisition. It is very productive and equal in quality to the tall Lima. I have also tried Giant Pascal Celery and consider it one of the best.

Mr. Brinser, chairman of the Committee on Exhibits, submitted the following:

Your committee begs leave to report the exhibit as follows:

H. S. Rupp, Shiremanstown, Pa.:

- One plate Dominie.
- One plate Winesap.
- One plate Strinetown pippin.
- One plate Fallawater.
- One plate Smith's cider.
- One plate York Imperial.
- One plate Krauser.
- One plate Rox russet.

W. H. Stout, Pine Grove, Pa.:

- One plate York Imperial.
- One plate Winesap.

J. Hibberd Bartram, Milltown, Pa.:

- One basket Kieffer pears; unusually fine specimens for the season.

Jacob L. Rife, West Fairview, Pa.:

- One plate Lancaster Greening.
- One plate York Imperial.
- One plate Newtown Pippin.
- One plate Carthouse or Romanite.
- One plate Strinetown Pippin.
- One plate Russet.
- One plate Ladies' Sweeting.
- One plate Vicar of Wakefield pears.
- One plate Shellbarks of extra large size. The exhibitor says good quality, but your committee had no means at hand to test them.
- One Cocoanut squash.

Calvin Cooper, Bird-in-Hand, Pa.:

- One plate Buckley apples; grown in Lancaster county, where they are said to be good bearers and long keepers.
- One plate Lawyer apples; exhibitor's name not given.

Respectfully submitted,

(Signed,)

E. C. BRINSER,
EDWIN W. THOMAS,
DAN'L D. HERR.

Committee.

The following resolutions were offered by Mr. Fox and unanimously adopted:

Resolved, That the State Horticultural Society of Pennsylvania has heard with profound regret of the death of Levi S. Reist, of Lancaster county, a member of this association and for many years a member of the General Fruit Committee. Deceased was prominently identified with the Lancaster County Agricultural and Horticultural Society, and during a long and busy life had manifested great devotion to the horticultural interests of his section of the State.

Resolved, That we will hold our deceased member in grateful remembrance for his co-operation in the work of this association.

Resolved, That a copy of these resolutions be transmitted to the family of the deceased.

Resolved, That the thanks of this association are due and are hereby tendered to Dr. Erwin F. Smith, of the Division of Vegetable

Pathology of the Department of Agriculture, for his attendance upon the sessions of this annual meeting, and for his exceedingly instructive and invaluable information upon the subjects of Peach Yellows, Diseases of Fruit Trees, The Value of Spraying, and The Use of Fungicides.

Resolved, that we extend our thanks to the local Committee of Arrangements for the efficient manner in which they discharged their duties, and which has resulted in this highly successful meeting; also, that our thanks are hereby returned to the newspapers of Harrisburg for their reports of our proceedings.

Adjourned.



PENNSYLVANIA STATE COLLEGE—PRINCIPAL BUILDINGS.

ANNUAL REPORT

—: OF :—

The Pennsylvania State College.

BOARD OF TRUSTEES.

EX-OFFICIO MEMBERS.

HIS Excellency ROBERT E. PATTISON,	Harrisburg,
<i>Governor of the Commonwealth.</i>	
THE Hon. WILLIAM F. HARRITY,	Harrisburg,
<i>Secretary of the Commonwealth.</i>	
GEORGE W. ATHERTON, LL. D.,	State College,
<i>President of the College.</i>	
JOHN McDOWELL, ESQ.,	Washington,
<i>President of the State Agricultural Society.</i>	
THE Hon. THOMAS J. STEWART,	Harrisburg,
<i>Secretary of Internal Affairs.</i>	
Gen. WALTER W. GREENLAND,	Harrisburg,
<i>Adjutant General.</i>	
N. C. SCHAEFFER, D. D.,	Harrisburg,
<i>Superintendent of Public Instruction.</i>	
JOSEPH M. WILSON, ESQ.,	Philadelphia,
<i>President of Franklin Institute.</i>	
THOMAS J. EDGE, ESQ.,	Harrisburg,
<i>Secretary of the State Board of Agriculture.</i>	

ELECTED MEMBERS.

<i>Names.</i>	<i>Residences.</i>	<i>Terms expire.</i>
The Hon. FRANCIS JORDAN,	Harrisburg,	1894
Capt. CHAS. W. ROBERTS,	West Chester,	1894
CYRUS T. FOX, ESQ.,	Reading,	1894
Gen. JAMES. A. BEAVER,	Bellefonte,	1894
GABRIEL HIESTER, ESQ.,	Harrisburg,	1894
The Hon. GEO. W. HOOD,	Indiana,	1895
ANDREW CARNEGIE,	Pittsburg,	1895
H. V. WHITE, ESQ.,	Bloomsburg,	1895
JOEL A. HERR, ESQ.,	Cedar Springs,	1895
The Hon. CYRUS GORDON,	Clearfield,	1895
*The Hon. JOHN H. ORVIS,	Bellefonte,	1896
The Hon. AMOS H. MYLIN,	Lancaster,	1896
The Hon. JOHN A. WOODWARD,	Howard,	1896
SAMUEL R. DOWNING, ESQ.,	West Chester,	1896
JAMES F. ROBB, ESQ.,	Pittsburg,	1896

The Hon. FRANCIS JORDAN,	Harrisburg,
<i>President of the Board.</i>	
GEO. W. ATHERTON,	State College.
<i>Secretary.</i>	
JOHN HAMILTON,	State College,
<i>Treasurer.</i>	

* Deceased Nov. 6, 1893.

FACULTY AND INSTRUCTORS.

GEORGE W. ATHERTON, LL. D., <i>President.</i> <i>Professor of Political and Social Science.</i>	HENRY J. WATERS, B. AG. S., <i>Professor of Agriculture.</i>
WILLIAM A. BUCKHOUT, M. S., <i>Professor of Botany and Horticulture.</i>	HENRY T. FERNALD, M. S., PH. D., <i>Professor of Zoology.</i>
I. THORTON OSMOND, M. S., M. A., <i>Professor of Physics.</i>	BENJAMIN GILL, M. A., <i>Professor of Latin.</i>
* JOSIAH JACKSON, M. A., <i>Professor of Mathematics.</i>	WILLIAM C. THAYER, M. A., <i>Professor of Modern Languages.</i>
HARRIET A. MCELWAIN, M. A., <i>Lady Principal; * Professor of History.</i>	E. W. MCCASKEY, 1st Lt. 21st INF., U. S. A., <i>Professor of Military Science and Tactics.</i>
LOUIS E. REBER, B. S., M. A., <i>Professor of Mechanics and Mechanical Engineering.</i>	JOHN PEMBERTON, C. E., U. S. N., <i>Associate Professor of Mechanical Engineering.</i>
WILLIAM FREAR, PH. D., <i>Professor of Agricultural Chemistry; Secretary of the Faculty.</i>	MAGNUS C. IHLSENG, E. M., C. E., PH. D., <i>Professor of Mining Engineering and Geology.</i>
† GEORGE GILBERT POND, M. A., PH. D., <i>Professor of Chemistry.</i>	JOHN PRICE JACKSON, B. S., M. E., <i>Assistant Professor of Electrical Engineering.</i>
HENRY P. ARMSBY, PH. D., <i>Lecturer on Animal Chemistry and Cattle Feeding.</i>	GEORGE C. BUTZ, M. S., <i>Assistant Professor of Horticulture.</i>
EDWIN E. SPARKS, M. A., <i>Principal of the Preparatory Department.</i>	THOMAS W. KINKAID, U. S. N., <i>Assistant Professor of Mechanical Engineering.</i>

* Deceased, Oct. 10, 1893. † In Europe, on leave of absence.

FRED E. FOSS, B. S., M. A.,
Assistant Professor of Civil Engineering.
 FRED P. EMERY, M. A.,
Assistant Professor of English and Rhetoric.
 WILLIAM H. CALDWELL, B. S.,
Assistant Professor of Agriculture.
 HARRY H. STOEK, B. S., E. M.,
Assistant Professor of Mining Engineering and Metallurgy.
 MADISON M. GARVER, B. S.,
Assistant Professor of Physics.
 FRANKLIN E. TUTTLE, B. A., PH. D.,
Instructor in Chemistry and Mineralogy.
 JENNIE J. WILLARD,
Instructor in Music.
 T. RAYMOND BEYER, B. S., C. E.,
Instructor in Civil Engineering.
 ANNA E. REDIFER,
Instructor in Industrial Art and Design.
 WILLIAM H. WALKER, B. S., PH. D.,
Instructor in Chemistry.
 MAURICE J. THOMPSON, B. A.,
Instructor in Mathematics.

WILLIAM MASON TOWLE, B. S.,
Instructor in Mechanical Engineering and Foreman of Shops.
 JOSEPH M. WILLARD, B. A.,
Instructor in Mathematics.
 THOMAS C. HOPKINS, M. S., M. A.,
Instructor in Geology.
 ERWIN W. RUNKLE, M. A., PH. D.,
Instructor in Psychology and Ethics.
 FRANK J. POND, B. S.,
Assistant in Chemical Laboratory.
 EDWARD P. BUTTS, B. S.,
Assistant in Civil Engineering.
 HERVEY E. DUNKLE, B. S.,
Assistant in Mechanical Drawing.
 JOSEPH M. WOLFE, M. A.,
Instructor in the Preparatory Department: Mathematics.
 WILLIAM M. TAGGART,
Instructor in the Preparatory Department: English and Latin.
 GEORGE W. HOSKINS,
Instructor in Physical Training.

AGRICULTURAL EXPERIMENT STATION.

Advisory Committee of the Board of Trustees.

THE HON. JOHN A. WOODWARD, *Chairman*, Howard.
 THE HON. AMOS. H. MYLIN, Lancaster.
 SAMUEL R. DOWNING, ESQ., West Chester.
 JOEL A. HERR, ESQ., Cedar Springs.
 GEO. W. ATHERTON, LL. D., State College.
 HENRY P. ARMSBY, PH. D., *Secretary of the Committee.*

Officers and Assistants.

THE PRESIDENT OF THE COLLEGE.
 HENRY P. ARMSBY, PH. D., *Director.*
 WM. FREAR, PH. D., *Vice Director and Chemist.*
 WM. A. BUCKHOUT, M. S., *Botanist.*
 GEO. C. BUTZ, M. S., *Horticulturist.*
 HENRY J. WATERS, B. AG. S., *Agriculturist.*
 WM. C. PATTERSON, *Superintendent of Farm.*
 MISS JULIA C. GRAY, *Secretary.*
 WM. H. CALDWELL, B. S., *Assistant Agriculturist.*
 WILLIAM S. SWEETSER, B. S.,
 JONS A. FRIES,
 JOHN W. FIELDS, B. S.,
 EDWIN J. HALEY, A. M.,
 MILTON E. McDONNELL,
 GEORGE BALDWIN, *Gardener.*
 ROBERT J. WELD, *Assistant in Field and Feeding Experiments.*

DESCRIPTION OF THE INSTITUTION.

The College was organized in 1859 as the "Farmers' High School," and its object then was to give an exclusively agricultural education. Its organization, however, was upon a collegiate basis from the beginning, and its name was, in 1862, changed to "The Agricultural College of Pennsylvania." Subsequently, the Legislature of the State having appropriated to it the income from the proceeds of the national land grant, and the field of its work having thus been necessarily enlarged, its name was, in 1874, again changed, and it has since been known as "The Pennsylvania State College."

The scope of the institution, as now organized, cannot be better stated than in the words of the Act of Congress, defining the duty of this and similar colleges:

"The leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislature of the State may prescribe, *in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.*"

This Act of Congress was, in 1863, "accepted by the State of Pennsylvania, *with all its provisions and conditions*, and the faith of the State * * * pledged to carry the same into effect." [*Laurel of 1863*, p. 214].

Based upon this broadened foundation, the special work of the State College is the training of youth in those branches of learning which lie at the foundation of modern industrial pursuits. In accordance with the purposes of its founders and the terms of its original charter, it aims to give special and prominent attention to agriculture, both theoretical and experimental; but it also provides "a liberal and practical education" in the leading branches of mathematical, natural and physical science, in order to prepare youth for "the several pursuits and professions in life." In other words, while the College is no longer exclusively agricultural, it is doing more in the direction of progressive and scientific agriculture than when that was its principal object; and at the same time, it has increased its subjects and courses of study, and its teaching and illustrative equipment, to such an extent that now "without excluding classical studies," its leading object is to teach the various sciences in such a manner as to show their applications in the more important industries—to combine with every branch of instruction such an amount of actual practice in the Shop, the Field, and the Laboratory as will serve to illustrate and apply the theory, but without subordinating it.

The range of its work in this direction is shown, as far as the limits of space allow, in the following descriptive statements and schedules. It is confidently believed that few institutions in the country furnish opportunity for obtaining an advanced scientific education of equal extent and thoroughness at so moderate a cost and with so many incidental advantages.

LOCATION.—The institution is situated in the village of State College, nearly twelve miles southwest of Bellefonte, and almost in the exact geographical centre of the State. Its position, in the midst of a broad, rolling valley, with Muncy mountain on the north, Tussey mountain on the south, and Nittany on the east, secures a varied and beautiful landscape and a healthful climate.

A special act forbids the sale of intoxicating drinks within two miles of the College, and all its surroundings are exceptionally free from demoralizing influences and from temptations to extravagance.

CAMPUS AND FARM.—The College grounds contain four hundred acres. The tract on which the buildings stand contains nearly three hundred acres. Of this, about fifty acres in the immediate vicinity of the buildings constitute the Campus and furnish recreation grounds, sites for residences, laboratories and other buildings. The Campus, tastefully laid out and adorned with trees, shrubbery, flower-gardens, walks and drives, is one of unsurpassed beauty. About forty acres are in natural forest growth, and the remainder is conducted with a view to furnishing an example of a model farm profitably managed. The Professors in charge of instruction in Agriculture and Horticulture make use of all parts of the College grounds for the purpose of practical illustration in their respective departments, one hundred acres being set aside for the exclusive use of the Experiment Station.

BUILDINGS.—The main College building is a plain and substantial structure of magnesian limestone, standing on a pleasant elevation, and is two hundred and forty feet in length, eighty feet in average breadth, and five stories in height, exclusive of attic and basement. It contains chapel, library, museums, society halls, class rooms and about one hundred dormitories. The building is heated throughout with steam, is lighted by electricity and is furnished on every story with pure water from an artesian well. A large part of the building has recently been thoroughly overhauled and rearranged, adding greatly to the facilities for work and for public gatherings. The sewerage system is well devised and frequently inspected, and the unusual exemption of our students from sickness testifies to the excellent sanitary condition of the building.

Within the last few years the College has greatly enlarged its facilities for instruction by the erection of new buildings, the reconstruction of old ones and the purchase of a large amount of equipment for the leading departments.

The Botanical Department,
The Chemical Department,
The Department of Physics,
The Departments of Civil, Electrical, Mechanical and Mining Engineering,
The Ladies' Department,
The Military Department,
The Agricultural Experiment Station.

Have each been provided with commodious and attractive buildings, designed and built with special reference to their adaptation to the needs of these several branches of work. The drill hall of the military department has also been fitted up for use as a gymnasium, with the Sargent system of movable apparatus. The building for the accommodation of civil, mechanical and mining engineering was opened with appropriate ceremonies, February 22, 1893, and was ready for occupancy at the opening of the fall session, in September, 1893.

This building is three stories high, with a deep and well-lighted basement, and has a frontage of 265 feet and an extreme depth of 208 feet. It has been carefully planned with reference to the needs of the several branches of instruction to which it is devoted, and is amply provided with lecture-rooms, laboratories, shops, testing-rooms, room for department libraries, model room, etc., etc., and equipped with the most modern machinery and appliances. The Boiler House and Dynamo Room from which heat, power and light are furnished for all the public buildings, are an integral part of the Engineering building; and their equipment is used as an addition to the apparatus of practical instruction and experimentation in steam and electrical engineering.

The College is thus prepared to carry on its several branches of work more efficiently and successfully than ever before, and every effort is made to provide this large increase of additional facilities without any considerable increase in the expenses of students.

ENDOWMENT.—The principal income of the College is derived from the proceeds of the sale of the public lands donated to the State by the General Government for College purposes. The State holds these proceeds in trust, for which it has given its bond for \$500,000, on which it pays interest to the College at the rate of 6 per cent. per annum. An additional sum of \$15,000 a year, to be increased \$1,000 annually until it amounts to \$25,000 a year, is appropriated to the College under the provisions of the Act of Congress, approved August 30, 1890.

TRUSTEES.—The control of the institution is vested in a board of trustees, consisting of twenty-three members. The *ex-officio* members are nine in number, and include official representation of the interests of the Commonwealth, of agriculture, of the mechanic arts and of general education. Of the other fifteen members one-third are elected annually at the College on the Tuesday following the tenth day of June—one by the Alumni of the College and the other four “by a body of electors composed of the Executive Committee of the Pennsylvania State Agricultural Society, the managers of the Franklin Institute of Pennsylvania, three representatives duly chosen by each county agricultural society in this Commonwealth, which shall have been organized at least three months preceding the time of election, and three representatives duly chosen by each association, not exceeding one, in each county of the Commonwealth, which shall have for its principal object the promotion and encouragement of the mining and manufacturing interests of the Commonwealth, and the mechanic and useful arts, and which shall, in like manner, have been organized at least three months preceding the time of election.”

PRACTICAL TRAINING (*Præctium*). The College has, from the first, sought to combine practical with theoretical instruction, and thus to fix in the student's mind a knowledge of both methods and principles. With this end in view, a portion of the student's time has been set apart for such training, and the number of subjects in which instruction is given, and the supply of apparatus for it has been increased until it covers an extensive range of topics, as will appear from an examination of the several schedules. A part of this training is largely technical, and so is almost wholly confined to certain courses. Other parts, however, are so general in their character as to be appropriately required of all students. Among these *præctiums* common to all, the following may be mentioned for the sake of illustration: *Drawing*, free-hand and mechanical; *Military Drill* required by the law of Congress, and helpful in securing right habits of body and mind; *Horticulture*, giving instruction in all ordinary operations belonging to fruit culture, such as pruning, grafting, budding and propagation by cutting and layers; *Mechanic Arts*, in which are learned the care and use of tools and the principal processes which lie at the foundation of all mechanical industries, without leading directly to any specific trade; and *Surveying*, which acquaints the student with the instruments of the art, and trains him to determine points, distances and areas.

Some of these *præctiums* not only give knowledge of almost universal use, but also serve to develop, during the early part of the course, tastes and aptitudes which may determine the student's choice of a technical course and of his life work.

In the Technical Courses, special lines of practice have a large amount of time given them proportionate to their importance for subsequent professional use. Each *præctium* is directed by an instructor who is familiar with both the theory and the practice, and with their mutual relations. The instruction is so largely personal that an earnest student may advance far beyond the average attainment required as a minimum. The experience of the College adds, from year to year, to the evidence that this training is highly valuable, and in directions which could not have been foreseen.

Increased teaching force has been provided in the departments of electricity, chemistry, mechanical engineering, zoology, civil engineering, mathematics, the English language, and industrial art and design, and a department of mining engineering has been established upon a broad foundation.

Even these changes have hardly kept pace with the immediate and urgent needs created by the increased number of students, and further additions to buildings and equipment are still imperatively required.

The additional aid given to the College by the United States government, during the last four years, places it upon a footing of assured prosperity. By the law approved March 2, 1887, Congress provided for an annual appropriation of \$15,000 a year for the sole purpose of maintaining work in agricultural experiment and research, and the work of the agricultural department is therefore well provided for.

By a law, approved August 30, 1890, the sum of \$15,000 for the first year, to be increased each year until it reaches \$25,000, to be paid out of the proceeds of the public lands, has also been appropriated to the institution in order to increase its facilities for instruction.

This additional appropriation is to be expended exclusively for instruction "in agriculture, the mechanic arts, the English language, and the various branches of mathematics, physical, natural and mechanical science, with special reference to their applications in the industries of life and to the facilities for such instruction."

It is this law that has made possible the increase of the teaching force in several departments already established, and will enable the College to provide still more efficiently for the various branches of science as applied to the industrial pursuits of the State.

COURSES OF INSTRUCTION.

The organization of the College is such that the instruction given naturally falls under several departments, which are distinct, and yet so mutually related as to form, when combined in groups, well proportioned, systematic and progressive courses of study. The number of such courses is now ten, viz:

I. General Courses :

1. A General Science Course.
2. A Latin-Scientific Course.

II. Technical Courses :

1. Agriculture.
2. Biology.
3. Chemistry.
4. Civil Engineering.
5. Electrical Engineering.
6. Mechanical Engineering.
7. Mining Engineering.
8. Physics.

Many of the studies of the first two years are the same in all the courses—these being intended to serve as a common foundation for both the general and the technical work of the Junior and Senior years, while the technical courses include a considerable amount of studies intended to promote general in distinction from special education. The experience of the College clearly shows that the time thus taken from strictly technical branches is far more than made up to the student by giving him a clearer and wider vision, and a more facile use of all his powers and acquirements.

The studies of the first two years furnish a fair degree of education for those who cannot take a full college course, but who desire to fit themselves well as land surveyors, or for any of the ordinary callings of life. Students leaving at this period of their course receive from the faculty a certificate showing the amount of work done.

Space will not allow a description of all the courses, but that in agriculture is given in full. Further information will be found in the catalogue which may be procured on application to the President of the College.

THE COURSE IN AGRICULTURE

Has been thoroughly recast in order to adapt it as far as possible to present requirements in both science and practice. The object of the Course is to give young men a thorough education at the same time that they are carefully instructed in the relations that the sciences bear to the various branches of Agriculture; to give both the mental training that is indispensable to success, and the scientific and technical knowledge requisite for becoming efficient workers in agricultural affairs, whether as practical farmers, teachers or investigators. Any lower aim would fail to meet not only the requirements of the laws under which the College is organized, but the progressive demands of the time. The constant object is to teach how the principal branches of physical and natural science are applied to the business of farming, and to afford a thorough and comprehensive knowledge of its principles and methods; to explain the nature of soils and manures, the reasons for and the best methods of tillage, the constituents and characteristics of plants and animals, and the conditions favorable to their development. Practice is combined with theory whenever the processes involve skilled labor, but the student's time is not consumed in merely manual operations.

As will be seen by an examination of the schedule of studies and practicums of this course, the time is fully occupied with instruction in the class-rooms, laboratories, orchard, vineyard and field, and no pains will be spared to give the earnest student a high degree of intellectual training, and thorough special preparation for the most advanced requirements of a farmer's calling. Increased teaching force and equipment have been provided for this department of instruction, and the opportunities offered to young men were never so complete and satisfactory as at the present time.

The instruction is so arranged as to begin the study of technical subjects in the Freshman year, and to continue them throughout the course. At least one technical study is taught every term of each year. Those technical subjects requiring the least previous preparation are taught in the earlier part of the course, while the student is securing a training in English, Mathematics, Elementary Chemistry and Modern Languages, which are essential to his further studies.

Inasmuch as agriculture involves so large a number of the sciences, the student is given a broad training in those studies. The studies in general science are: Chemistry, three terms; Botany, three terms; Biology and Zoology, three terms; Physics, two terms; and Geology, two terms.

History, Political Economy, Constitutional and International law are taught as a preparation for the duties of citizenship. No class of citizens have greater need than farmers of a clear understanding of public questions as they affect themselves and the public interest.

What may be considered the technical or special studies of the course are arranged in the following order:

RURAL ECONOMY.—Farm management and plans; kinds of farming, as general, special, intensive, extensive, stock, dairy and grain, and the essential elements of success in each; farming as a business; marketing; relation of farming to other industries; the farmer as a producer, manufacturer, merchant, transporter and consumer.

RURAL LAW.—A study of the laws which most directly concern farming.

FARM APPLIANCES AND BUILDINGS.—Kinds and adaptation of farm implements and machinery; application of different kinds of power to farm purposes; plans and essential features of farm buildings; fences, roads and water supply.

AGRICULTURAL CHEMISTRY.—Taught by lecture, with references to Johnson's "How Crops Feed" and "How Crops Grow."

Plants.—How they grow; the chemical elements indispensable to their growth and the compounds from which plants can take them up; how plants feed; the compounds formed in the plants; variations in plant composition due to differences in species, variety, stage of maturity, climate and supply of plant food; germination; fermentation.

Chemistry of soil and water.—Mineral basis of the soil; composition of rocks; changes due to weathering; translocation and disposition of soils; classification of soils, mechanical analysis; formation of organic matter in the soil; its composition, the changes it undergoes, and its uses; nitrification; power of soil to fix chemical compounds introduced; its relation to losses in drainage; the air and water of the soil; composition of river and mineral waters as compared with rain water; soil heat in its relation to soil chemistry.

Improvement in the soil.—Chemical effects of tillage, drainage, irrigation, addition of sand, burning and fallowing.

Fertilizers.—Indirect fertilizers—Effects of lime and other compounds of the earthy bases.

Direct fertilizers—Phosphates, potash, salts, nitrogenous compounds—their sources, manufacture and use. Green manures; stable manure and its preservation; sewerage and factory waste; composting.

Maintenance of fertility. Fertilizer theories; relation to systems of agriculture.

Practicums.—Include lectures and laboratory practice, on the methods of quantitative analysis applied to fertilizers, rocks, soils, foods, milk, etc.

STOCK FEEDING.—

Animal Chemistry.—General composition of animal body; chemistry of digestion and absorption; the blood; body wastes; functions of the various nutrients in the formation of tissue and the production of heat and work.

Feeding stuffs.—Composition and digestibility as affected by soil, manure, rate of seeding, etc. etc. Sources, composition and uses of bye fodders. Preservation and preparation of fodders—hay-making, ensilage, steaming and cooking feed.

Feeding for special purposes.—Nutrients, fodders and rations. Feeding standards, calculation of rations. Fuel value of fodders and rations. Maintenance rations. Excess food.

Feeding working animals.—Influence of work on metabolism. Source of muscular power.

Feeding for meat production.—Beef, mutton and pork. Differences in nutrition of young and mature animals. Growth and fattening. Influence of food on carcass.

Feeding for milk.—Nature and composition of milk; formation of milk in the udder; influence of food on yield and composition of milk; effects of breed, individuality, period of lactation, etc.; effect of feed on quality of dairy products.

ANIMAL HUSBANDRY.—Principles of stock breeding—heredity, atavism, variation, laws of correlation, terms used—thoroughbred, in-breeding, pedigree, parental, mental, climatic influences; controlling sex; selection; period of gestation. Care and management of live stock; handling and training. History, characteristics and purposes of breeds of live stock. A few of the leading types of live stock are kept on the farm, which give the students opportunity for judging and scoring and for studying the essential points of breeds adapted to different purposes. Some of the finest speci-

mens of many of the breeds are illustrated by lithographs, photographs and lantern slides. By means of herd books and other historical literature on such subjects, the methods of producing these specimens are studied. Students wishing to make a specialty of any particular breed or breeds will be afforded facilities and directed in the way of doing so.

DAIRY HUSBANDRY.—Statistics of products and consumption; adaptation to certain sections; winter or summer dairying, dairy or creamery; characteristics, testing and selling of milk; butter and cheese making; effect of foods on products; breeds of dairy cattle, their rearing, management and replenishment.

SOILS.—Kinds; physical properties; cultivation, drainage and irrigation.

Cultivation.—Reasons, methods and appliances.

Drainage.—Practical details of farm and road drainage; leveling and locating drains, material, size, shape, depth, grade and number; effect of drainage; cost and profit; machines and appliances.

Irrigation.—General features; adaptation to localities; methods; surface or sub-irrigation.

FARM CROPS.—The history, production, uses, chief characteristics and essential elements of successful culture of each of the principal farm crops. For example, the subject of Indian corn is treated under the following heads: History, production, use, structure, cross-fertilization, chemical composition, climate, soil, varieties, vitality, culture, harvesting.

HORTICULTURE.—Instruction in Horticulture is given largely by the practical operations of the garden and orchard, such as pruning, grafting, budding and making cuttings and layers.

Fruits.—Methods of propagation; preparation of ground; cultivation and after treatment. Storage and marketing; hybridization and origination of new varieties; diseases and their remedies.

Vegetables are considered in the same general way. The history and peculiarities of individual varieties are studied and also the best methods employed in their cultivation.

Ornamental plants: their nature and use in landscape gardening.

The aim is to cover all parts of the subject of Horticulture, and in the green-houses, gardens, orchards and grounds of the College students have a most excellent opportunity for seeing a great variety of both the useful and ornamental plants under cultivation and experiment.

ECONOMIC ENTOMOLOGY is taught in connection with the study of Zoology. The structure and life history of insects are fully studied, after which special study is made of the principal beneficial and injurious species.

METEOROLOGY.—Abercromby's Weather, supplemented by lectures.

COMPARATIVE ANATOMY is taught in connection with the study of Biology and Zoology.

VETERINARY SCIENCE.—Preventive measures, common accidents, principal diseases among farm animals.

HISTORY OF AGRICULTURE in those countries from which we derive our agricultural practices and products; American agriculture; present agricultural methods in foreign countries.

FORESTRY. Including not only a study of various forest trees, and their uses, but also the production and conservation of forests and forest conditions. Instruction will be chiefly by lectures, and the subject will be made as practical as possible.

SHORT COURSE IN AGRICULTURE.

A set of lectures on technical agricultural subjects will be given during the winter term. The lectures for the winter of 1894 begin Wednesday, January 3, and continue twelve weeks.

While all applicants over fifteen years of age will be admitted without examination, the better the previous preparation the greater will be the benefit obtained by those attending the lectures.

These lectures are designed for those whose time for the study of this subject is limited to one or two winters. It is the aim to give as large an amount of thoroughly useful information about farming and gardening and the principles underlying the art, as time will show.

The lectures will be divided into four general heads, viz.: *Agriculture; Agricultural Science; Horticulture and Economic Entomology; Veterinary Science.* These lectures will be given by men who have had special training in the several lines of which they treat.

LECTURES.

1. *Agriculture—60 lectures treating of*

Farm management,
Drainage,
Road making,
Breeds, breeding and management of live stock,
Dairying,
Cultivation of farm crops.

The *practicums* in this line will consist of practice in the measurement, planning and mapping of farms and farm buildings; leveling for drains and roads; practice in judging live stock; practice in handling milk and making butter by various approved methods; taking notes upon the feeding and management of live stock on the Experimental and College farms, as well as taking notes upon the various operations of each.

2. *Agricultural Science* -60 lectures treating of

elementary notions of chemistry and physics; chemical elements of agricultural importance and some of their compounds. Chemistry of air and water.

Soils.—How they are formed; their chemical and physical differences.

Plants.—How they grow; the chemical elements indispensable to their growth and the compounds from which plants can take them up; how plants feed; the compounds formed in the plants; varieties in plant composition due to differences in species, variety, stage of maturity, climate and supply of plant food; germination, fermentation.

Animals.—General composition of animal body; chemistry of digestion and absorption; the blood; body waste; functions of the various nutrients in formation of tissues and production of heat and work.

Feeding stuffs.—Composition and digestibility as affected by soil, manure, rate of seeding, etc., etc. Sources, composition and uses of by products. Preservation and preparation of fodders, hay-making, ensilage, steaming and cooking feed.

Feeding standards and calculations of rations. Growth and fattening; feeding for meat, milk, wool, etc.

Milk.—Its nature and composition, variation in composition as affected by food, breed and individuality. Effects of feed on quality of dairy products.

Practicum.—Milk testing, one hour per week.

3. *Horticultural and Economic Entomology* -60 lectures treating of

the ordinary vegetables and fruits. Their treatment and cultivation, together with their insect enemies and the best methods of destroying the injurious kinds. Green-houses and other facilities make it possible to give a practical course on these subjects even in the winter season.

4. *Veterinary Science*—24 lectures treating of

common diseases and accidents, with Clinics once a week.

Students may select between practicum in Agriculture and Horticulture according to their individual needs and desires, and thus emphasize that line of work to which they wish to give the most attention.

This course is not intended in any sense to take the place of the regular four years' course, but to supplement it. It is hoped that this short course will meet the wants and needs of a large body of earnest, bright young men in the Commonwealth of Pennsylvania who wish a fuller knowledge of modern farm methods. It should in no case be taken as a substitute for the more thorough, and hence in the end, more practical four years' course. Every young man who has the time and means should take the more extended course. The largest measure of success involves such a wide range of knowledge that the most thorough technical training is required.

No charge will be made at present to persons attending these lectures, except the fee of five dollars to cover incidentals, and the small laboratory fee in special cases. Rooms in the College dormitories cannot be guaranteed, but will be provided at the usual rate as far as possible. Those who desire to attend should make application as long in advance as possible.

AGRICULTURAL EXPERIMENT STATION.

The Agricultural Experiment Station, as a distinct branch or department of the College, was organized by the Trustees in 1887, in accordance with the provisions of the Act of Congress, generally known as the Hatch Act. The College had for several years carried on extensive lines of research and experiment, and these are being continued and greatly enlarged under the new organization.

The funds specifically devoted to the work of the Station are expended in making such experiments and investigations as seem best adapted to render practical and efficient aid to the farmers of the State in the pursuit of their calling. Various experiments of this sort have been completed and numerous others are now in progress. The results are published quarterly in the form of bulletins, and the year's work is summed up in an annual report. Both reports and bulletins are printed for gratuitous distribution, and will be mailed regularly, free of charge, to any citizen of the State applying to the Director, Dr. H. P. Armsby.

The Station also invites correspondence and suggestions from farmers and others interested in its work, and inquiries upon matters pertaining to agriculture or horticulture will be cheerfully answered by the Director, as far as possible.

All communications to this department should be addressed "Agricultural Experiment Station, State College, Pa."

MECHANIC ARTS.

This course has been in full operation since September, 1884. The course is designed to afford such students as have an ordinary common school education an opportunity to continue the elementary scientific and literary studies, together with mechanical and free-hand drawing, while receiving theoretical and practical instruction in the various mechanical arts.

The instruction in shop work is given by means of exercises so planned as to include, in a systematic manner, the operations in use in the various trades, but, the object being to give instruction in the use of tools, only such constructions are made as cover principles, without undue repetition.

The first instruction in carpentering and joining is in the use of the saw and plane in working wood to given dimensions, and a series of elementary exercises follows in order, such as practice in making square joints, different kinds of dove-tails, the various tenons, roof-trusses, panels, etc.

The instruction in turning and circular-section pattern-making also is given from a series of exercises.

In the forge-shop are taught the management of the fire and the degrees of heat necessary to forge different metals. Drawing, forming, bending, upsetting, fagoting, splitting, punching, chamfering, annealing, tempering, case-hardening, etc., are taught by means of a series of exercises in which the elements of the iron forger's art are particularly dwelt upon. Every piece is made to certain dimensions laid down upon the drawing, the article being forged before the class by the instructor who directs attention to the essential feature of the operation, which is then repeated by each student.

The course in vice work includes filing to line, filing to template, free-hand filing, fitting and chipping straight and grooved surfaces in cast iron, wrought iron and steel.

In the machine shop, the student, after having the lathe and its mechanical construction explained to him, is taught centering, tape-turning, chucking, reaming, inside and outside screw-cutting, bolt-turning, etc. He is then required to construct some pieces of mechanism in which many of these principles are involved.

The drawing of this course extends through the entire three years.

This work is looked upon as of the highest importance, and the effort is to make the instruction thorough, practical and of direct utility. Considerable time is devoted to free-hand drawing, and it is believed that it not only assists in mechanical drawing but it is of great service in after years, whatever the occupation chosen.

The mechanical drawing consists of a series of exercises, and such are selected as will be of subsequent use. They are arranged in progressive order, beginning with geometrical constructions involving straight lines and circular arcs only, and ending with the more complex curves, such as the ellipse, helix, epicycloid, etc.

Projection is next taken up. The instruction in this is from models, so that the student may have before him the actual object from which the projection is made, and not be obliged to depend upon his unaided conception. After completing this work he is required to draw parts of the machines from actual measurements. For this purpose he is given some piece of mechanism to sketch and measure, of which, finally, he is to make complete working drawings.

The mathematical instruction of the course covers Algebra, Plain and Solid Geometry, Plane and Spherical Trigonometry and Land Surveying, taught with special reference to this class of students, many practical applications being made. The department is already well equipped, but additions of machinery are being made, from time to time, to meet the requirements of the course.

GENERAL STATEMENTS.

1. DEGREES.

The Degree of Bachelor of Science is conferred upon graduates of the four years' Courses. The diploma given to graduates of the Technical Courses contains mention, also, of the special line of technical work pursued.

The Degree of Master of Arts or Master of Science is conferred upon graduates of the State College, of at least three years' standing, who are known to have been systematically pursuing scientific, literary, or professional studies, and upon graduates of this or other institutions who have, satisfactorily to the Faculty, studied at least one year in the Graduate Courses.

2. GRADUATE INSTRUCTION.

Persons who have been graduated in one of the Regular Courses here, or an equivalent course elsewhere, are permitted to enter the College for instruction in an advanced course, consisting of such studies as may, in each case, be approved by the Faculty.

3. LIBRARIES AND READING-ROOMS.

The Library belonging to the College has over eight thousand volumes, embracing scientific and technical works, memoirs, scientific essays, agricultural and educational works, etc., in English, French and German, forming the foundation of a good Scientific Library. Four or five hundred volumes per year are being added.

The Reading-room, in connection with the College Library, offers to Faculty and Students an ample and well-selected list of scientific and other periodicals. The Engineering Departments are provided with a special reading room and library supplied with the best technical works and magazines.

Each of the two Students' Literary Societies has a good Library of standard and miscellaneous works, and a reading-room supplied with some of the principal literary periodicals and newspapers of the day.

4. FREE (SENATORIAL) SCHOLARSHIPS.

The Trustees have established fifty scholarships, one for each Senatorial district in the State, entitling the holder to exemption from all College charges (except for lights and for material used in the Laboratories), in any of the REGULAR FOUR YEARS' COLLEGE COURSES. The scholar, male or female, is to be appointed by the Senator of the district, after a competitive examination in the studies required for admission to the Freshman class (General Science Course), or to the third year of the Course in

Mechanic Arts. No person is eligible as a candidate who has previously been admitted to any College class.

The holder of the scholarship is admitted to any of the **REGULAR COLLEGE COURSES** (but not to the *Preparatory or Special courses*) free of the ordinary charges for incidentals, room rent, fuel and furniture. This allowance amounts, at the present rate of charges, to fifty dollars a year, and is continued the entire College course, provided that both conduct and class standing be satisfactory to the Faculty. A vacancy may be filled after the opening of the college year, if the appointee's attainments do not fall below the standard of the class at the time of application for admission. For information as to vacancies, time and place of examination, etc., candidates for scholarships should apply to their Senator (in whose hands the details of appointment have been placed by the College) or to the President of the College.

5. EXPENSES.

No charge whatever is made for Tuition, except for special instruction in music.

INCIDENTALS.—Each student, whether from a distance or resident in the neighborhood, is required to pay \$17.00 a year for the heating, lighting, and care of the recitation and other public rooms, viz: \$7 for the Fall session, \$5 for the Winter, and \$5 for the Spring. This is the only charge (except a small laboratory fee in some of the courses) made to students who do not occupy college rooms.

ROOM RENT.—Preparatory students are required to occupy rooms in the college dormitories; but college students may occupy rooms elsewhere, subject in all cases to the approval of the Faculty. To those who rent rooms in the college dormitories, the uniform charge is as follows:

		Fall Session.	Winter Session.	Spring Session.
1. Students not renting a College room,	Incidentals,	\$7 00	\$5 00	\$5 00
2. Students renting a College room—(Rooming alone), . . }	Incidentals,	\$7 00	\$5 00	\$5 00
	Room rent	15 00	18 00	12 00
	Light,	3 50	8 50	2 50
	Key deposit,	50	50	50
		\$26 00	27 00	20 00
3. Students renting a College room—(With room-mate), . . }	Incidentals,	\$7 00	\$5 00	\$5 00
	Room rent,	11 00	14 00	8 00
	Light,	1 75	1 75	1 25
	Key deposit,	50	50	50
		\$20 25	\$21 25	\$14 75
4. Senatorial Students—(Rooming alone), }	Room rent,	\$4 00	\$4 00	\$4 00
	Light,	3 50	3 50	2 50
	Key deposit,	50	50	50
		\$8 00	\$8 00	\$7 00
5. Senatorial Students—(With room-mate), }	Light,	\$1 75	\$1 75	\$1 25
	Key deposit,	50	50	50
		\$2 25	\$2 25	\$1 75

By a resolution of the Board of Trustees, each student, before he is permitted to enter his name upon the College roll, is required to pay an amount sufficient to cover all his College bills for the current session, besides a special deposit of \$5 as a security against general damages, or, in case he cannot pay immediately, to give a note with sufficient security, for the payment at some future time, unless excused by the Executive Committee.

LABORATORY EXPENSES.—Students during the time they are engaged in laboratories, pay a small charge for their outfit; also, for apparatus destroyed and material consumed by them. Such charges, at present, are as follows:

Botany, per term,	\$1 00
Zoology, per term,	2 00
Carpentry, per course,	2 50
Wood-work, per course,	2 50
Forging, per course,	3 50
Chipping and filing, per course,	3 00
Machine work in iron,	4 00
Chemistry, per term,	10 00
Physics, per term,	1 00
Physics and Electrical Engineering, per term,	2 00

In the chemistry practicum, accounts are kept with individual students, who are liable for any excess above the amount paid in advance.

BOARD.—The College does not maintain a boarding hall, and most students depend upon the boarding-houses, in the vicinity, the regular charge being \$3 per week. The College provides facilities for Boarding Clubs which supply their members with good board at from \$2.50 to \$3.00, according to the varying wishes of the club. The College year is thirty-six weeks.

FURNITURE.—The furniture provided for students who room in the College dormitories consists of a bedstead, mattress, table, washstand and chair. The student provides all other articles, including pillow, bedding, washbowl, pitcher, mirror, etc. In the Ladies' Cottage everything is provided except bed clothing and towels.

UNIFORM.—Each cadet is required to provide himself with a uniform, the coat and cap of dark blue cloth, the pantaloons of lighter blue. The entire suit is exceedingly neat and serviceable, and may be worn on any occasion. Measures are taken at the College, and orders filled by some approved maker. The uniform of cadets costs, at present, \$14.65, \$18.55 or \$21.05, according to the quality selected; and must be paid for when ordered.

MUSIC.—Instruction in vocal music or on the piano or cabinet organ will be given at the rate of \$10 for twenty lessons, and \$3 per quarter (two hours daily) for use of instrument in practicing. Instruction in Harmony, \$5 for twenty lessons.

The charge to pupils not in regular standing in the College is a matter of private arrangement with the Instructor. The present charge in such cases is \$15 for twenty lessons.

WASHING is at the rate of fifty cents per dozen.

BOOKS AND STATIONERY can be procured at stores and at the College, at regular retail prices.

DAMAGES.—Persons causing special damages will be required to pay for the same. General damages will be assessed upon the body of students.

All remittances should be made to the President, State College, Centre County, Pa., by draft or by money order drawn on State College post office.

ADMISSION TO COLLEGE.

Examinations for admission are held on Thursday of Commencement week, and on the day before the opening of the Fall session, the dates being for 1894, the 14th of June and the 12th of September, respectively. It is desirable, on every account, that candidates be present on one or both of these days. Those who cannot do so will be examined at any time during the year, and admitted to the class for which they are found prepared.

In all cases, the applicant for admission must present evidences of good character, and, when coming from another institution, of honorable dismissal.

For admission to the Freshman class, candidates (of either sex) must be at least fifteen years of age, and pass a satisfactory examination in the following subjects:

1. FOR THE COURSES IN GENERAL SCIENCE, AGRICULTURE, BIOLOGY, CIVIL, ELECTRICAL, MECHANICAL, MINING ENGINEERING, AND PHYSICS:

English Grammar; Arithmetic; Geography, both Descriptive and Physical; United States History; Physiology; Higher Algebra, through Quadratics and Progressions; Wentworth's Plane Geometry, all; and the elements of Physics, as much as is contained in Avery, Rolfe and Gillet, or Gage.

2. FOR THE LATIN-SCIENTIFIC COURSE: The same as above, with the addition of four books of Cæsar and four orations of Cicero.

3. FOR THE SPECIAL COURSE IN CHEMISTRY: Applicants will be admitted without examination, except in Mathematics.

In that branch, at present, the applicant must be fully prepared to pass examination in Arithmetic, including the Metric system, and the first two hundred pages of Newcomb's Elementary Algebra, or an equivalent; but in order to derive the greatest advantage from the course, it is recommended that students be so far advanced as to have completed the Mathematical Studies of the Freshman year.

4. FOR THE COURSE IN MECHANIC ARTS: The same as for admission to the Preparatory Department.

5. FOR ELECTIVE COURSES, applicants must at least be prepared to enter the Freshman class, General Science Course.

IN LIEU OF EXAMINATION.

1. GRADUATES OF STATE NORMAL SCHOOLS and of a SELECT LIST OF HIGH SCHOOLS AND ACADEMIES in Pennsylvania, whose standard of requirements has been ascertained to be satisfactory, will be admitted to the Freshman class without further examination in studies which, as shown by their diploma or certificate, they have successfully completed in such institution. *Such certificate must show specifically the amount of work done and the text book used in each subject.*

2. THE HOLDERS OF SENATORIAL SCHOLARSHIPS are admitted provisionally on the certificate of the Examining Committees in the several Senatorial districts.

ADVANCED STANDING.

APPLICANTS FOR ADVANCED STANDING, in any course, must pass a further examination in the studies which have been pursued by the class for which they are candidates.

THE FULL COURSES OF INSTRUCTION occupy four years, with three terms, or sessions, in each year. The following Schedules of Studies indicate the amount of work required in the several Courses, or the equivalent, which will be accepted from candidates for advanced standing. A detailed schedule of the course in agriculture is omitted, the work having been fully outlined on a preceding page.

Specimens of Examination Papers will be furnished on application.

1. GENERAL SCIENCE COURSE.

[Figures after subjects indicate hours of recitation or practice per week; *Italics*, title of Text Books.]

Freshman Year.

FALL SESSION.

MATHEMATICS.—Wentworth's *College Algebra* (4). Solid Geometry, Wentworth or Chauvenet (3.)

LANGUAGE.—French or German, Whitney's *Grammar, Part I, Super's Reader*; Otis' *Elementary, Part I*. Buchelm's *Modern German Reader, Part I* (4); English, Genung's *Hand-Book of Rhetorical Analysis* (4).

Practicums (10).—Freehand Drawing (2), Geometric Drawing (4), English (4).

WINTER SESSION.

MATHEMATICS.—Trigonometry, Wheeler (5).

LANGUAGE.—French or German, Whitney's *Grammar, Part I, completed, Historiettes Modernes* (Fontaine); Otis' *Elementary Part II*, Storm's *Immensee*, Stifter's *Haidedorf*. (5); English, Genung's *Practical Rhetoric* (4).

MILITARY TACTICS.—U. S. *Infantry Drill Regulations* (1).

Practicums (10).—Projection Drawing (4), Carpentry (6).

SPRING SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (5).

LANGUAGE.—French or German, *Sept Grandes Auteurs au XIXme Siecle* (Fortier); *Novelletten Bibliothek* (Bernhardt) (4); English, Morris' *Specimens of Early English, Part I* (3).

HISTORY.—Fisher's *Outlines—Ancient* (3).

Practicums (10).—English (4), Horticulture (2), Drawing (4).

Sophomore Year.

FALL SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (4).

SURVEYING.—Bellows' and Hodgman's *Manual* (1).

LANGUAGE.—French or German, Luquien's *French Prose of Popular Science*; Hodges' *Scientific German* (2).

CHEMISTRY.—*Lectures on the Non-Metals* and Harris' *Lecture Notes on General Chemistry* (5).

HISTORY.—Fisher's *Outlines—Medieval* (3).

Practicums (10).—Surveying (4), Chemistry (4), Bibliography (2).

WINTER SESSION.

MATHEMATICS.—Calculus, Taylor (3).

LANGUAGE.—French or German, Super's *Historical Readings*; Gore's *German Science Reader* (2).

CHEMISTRY.—*Lectures on the Metals* and Harris' *Manual of Qualitative Analysis* (3).

BIOLOGY.—*Lectures on General Biology* (3).

HISTORY.—Fisher's *Outlines—Modern* (4).

Practicums (10).—Chemistry (8), Biology (2).

SPRING SESSION.

MATHEMATICS.—Calculus, Taylor (4).

LANGUAGE.—French or German, Chateaubriand's *Atala*, *Rene* and *Le Dernier Abbeucrage*; Keller's *Dieteren* and Freytag's *Soll und Haben* (4).

CHEMISTRY.—Same as Winter Session (3).

BIOLOGY.—*Lectures on General Biology* (4).

Practicums (10).—Chemistry (6), General Biology (4).

Junior Year.

FALL SESSION.

LANGUAGE.—French or German, On the basis of Fortier's *Sept Grands Auteurs*, etc., will be read: Lamartine, *Graziella*; Victor Hugo, *La Chute* and *Le Guef-Apens* (*Les Misérables*); De Vigny, *Cinq Mars*; De Musset, *Pierre et Camille*; Gauthier, *Voyage en Espagne*; Merimee, *Columba*; Cooper, *Selections* (ed. Jenkins); Goethe's *Meisterwerke* (Bernhardt), with copious extracts from other masterpieces in prose and poetry, and Schiller's *Ballads* (ed. Johnson) (4).

PHYSICS.—Mechanics, Lodge; Electricity, Poyser (4).

BOTANY.—Bastin's *College Botany* (4).

PSYCHOLOGY.—James (3).

Practicums (10).—Physical Measurements (4), Botany (6).

WINTER SESSION.

LANGUAGE.—French or German, Guizot's *Histoire de la Civilisation en Europe*; Freytag's *Aus dem Mittelalter* (3).

PHYSICS.—Sound, Stone; Light *Lectures* and Deschanel (4).

BOTANY.—Bastin's *College Botany and Lectures* (4).

LOGIC.—Jevons (4).

Practicums (10).—Physical Laboratory (4), Botany (6).

SPRING SESSION.

PHYSICS.—Heat, Garnett (4).

ZOOLOGY.—*Lectures* (4).

ETHICS.—Bowne (5).

LANGUAGE.—French or German, Hugo's *Ermant* with *Lectures* on the Romantic Movement; Sybel's *Die Erhebung Europas gegen Napoleon I* (2).

Practicums (10).—Physical Laboratory (4), Mineralogy (6).

Senior Year.

FALL SESSION.

ZOOLOGY.—Entomology, *Lectures* (4).

GEOLOGY.—Dana (4).

ECONOMICS.—Walker's *Political Economy* (4).

PHILOSOPHY.—Schwegler's *A History of Philosophy* (3).

Practicums (10).—Zoology (4), Geology (6).

WINTER SESSION.

ASTRONOMY.—Young's *General* (3).

GEOLOGY.—Dana (3), or ZOOLOGY, Vertebrate, *Lectures* (3).

CONSTITUTIONAL LAW.—Cooley's *General Principles* (4).

HISTORY.—Guizot's *History of Civilization* (4).

Practicums (12).—Geology (4), or Zoology (4), Physiological Psychology (8).

SPRING SESSION.

ASTRONOMY.—Young's *General* (3).

INTERNATIONAL LAW.—Woolsey (5).

LITERATURE.—Taine's *History of English Literature* (5), or METEOROLOGY (3), and FORESTRY—*Lectures* (3).

HISTORY OF EDUCATION.—Painter (2).

Practicums (10).—Original Work—elective (5), Graduation Thesis (5).

COURSE IN AGRICULTURE.

Freshman Year.

FALL SESSION.

MATHEMATICS.—Solid Geometry, Wentworth on Chauvenet (3).

LANGUAGE.—English, Genung's *Hand Book of Rhetorical Analysis* (4).

CHEMISTRY.—*Lectures on the Non-Metals and Harris' Lecture Notes on General Chemistry* (5).

AGRICULTURE.—Rural Economy, *Lectures* (3).

Practicums (12).—Agriculture (6), Drawing, Geometrical and Projection (4), Chemistry (2).

WINTER SESSION.

MATHEMATICS.—Trigonometry, Wheeler (5).

LANGUAGE.—English, Genung's *Practical Rhetoric* (4).

CHEMISTRY.—*Lectures on the Metals and Harris' Manual of Qualitative Analysis* (3).

AGRICULTURE.—Rural Law, Haigh's *Manual of Farm Law* (2).

MILITARY TACTICS.—U. S. *Infantry Drill Regulations* (1).

Practicums (12).—Agriculture (4), Chemistry (8).

SPRING SESSION.

LANGUAGE.—Old English, Morris' *Specimens of Early English, Part I* (3).

CHEMISTRY.—Same as *Winter Session* (3).

HISTORY.—Fisher's *Outlines—Ancient* (3).

AGRICULTURE.—Farm Appliances and Buildings, *Lectures and Thomas' Farm Implements* (3).

AGRICULTURE CHEMISTRY.—*Lectures and Johnson's How Crops Grow* (4).

Practicums (10).—Agriculture (2), Agricultural Chemistry (3), Chemistry (6).

Sophomore Year.

FALL SESSION.

LANGUAGE.—German, Otis' *Elementary, Part I*, Buckhelm's *Modern German Reader* (4).

MATHEMATICS.—Surveying, Johnson (1).

HISTORY.—Fisher's *Outlines—Medieval* (3).

AGRICULTURAL CHEMISTRY.—*Lectures* (5).

Practicums (14).—Agricultural Chemistry (10), Surveying (4).

WINTER SESSION.

LANGUAGE.—German, Otis' *Elementary, Part II*; Storm's *Immensee*; Sufter's *Haukedorf* (5).

HISTORY.—Fisher's *Outlines—Modern* (4).

GENERAL BIOLOGY.—*Lectures* (3).

AGRICULTURAL CHEMISTRY.—*Lectures* (3).

Practicums (12).—Agricultural Chemistry (4), Biology (2), Mechanic Arts (6).

SPRING SESSION.

LANGUAGE.—German, *Novellen Bibiothek* (Bernhardt) (4).

BIOLOGY.—General, *Lectures* (4).

AGRICULTURE.—Stock Feeding, *Lectures and Armsby's Cattle Feeding* (5).

Practicums (14).—Biology (4), Agriculture (6), Stock Feeding (4).

Junior Year.

FALL SESSION.

PHYSICS.—Mechanics, Lodge; Electricity, Poyser (4).

BOTANY.—Bastin's *College Botany* (4).

AGRICULTURE.—Soils, *Lectures and Elliott's Practical Farm Drainage* (2); Animal Husbandry, Saunders' *Horse Breeding and Curtis' Horses, Cattle, Sheep and Swine* (5).

Practicums (10).—Botany (6), Soils (4).

WINTER SESSION.

PHYSICS.—Sound, Stone: and Light, *Lectures* and Deschanel (4).

BOTANY.—Cryptogamie, *Lectures* (4), Economic, *Lectures* (2).

AGRICULTURE.—Dairy Husbandry, *Lectures* and Stewart's *Dairyman's Manual* (5).

Practicums (12).—Cryptogamie Botany (6), Dairying (6).

SPRING SESSION.

PHYSICS.—Heat, Garnett (4).

AGRICULTURE.—Horticulture, *Lectures* (5). Meteorology, *Lectures* (2), Forestry, *Lectures* (3).

Practicums (14).—Horticulture (10), Meteorology (4).

Senior Year.

FALL SESSION.

ECONOMICS.—Walker's *Political Economy* (4).

AGRICULTURE.—Horticulture, *Lectures* (2); *Lectures on Entomology and Comparative Anatomy* (4).

GEOLOGY.—Dana (4).

Practicums (12).—Entomology (4), Horticulture (8).

WINTER SESSION.

POLITICAL SCIENCE.—Cooley's *General Principles of Constitutional Law* (4).

GEOLOGY.—Dana (2).

AGRICULTURE.—*Lectures on Farm Crops* (5); *Lectures on Agricultural Chemistry, Horticulture or Veterinary Science* (4).

Practicums (10).—Agricultural Elective and Thesis.

SPRING SESSION.

POLITICAL SCIENCE.—Woolsey's *International Law* (5).

AGRICULTURE.—*Lectures on Agricultural Chemistry, Horticulture or Veterinary Science* (5); *Lectures on History of Agriculture* (3); *Lectures on Highway Engineering* (2).

Practicums (10).—Agricultural Elective and Thesis.

Elective

Thesis

of

the

year

COURSE IN BIOLOGY.

Freshman Year.

FALL SESSION.

MATHEMATICS.—Wentworth's *College Algebra* (4). Geometry, Wentworth or Chauvenet (3).

LANGUAGE.—French or German, English or Latin—Whitney's *Grammar, Part I*; Super's *Reader*;

Otis' *Elementary, Part I*; Buchheim's *Modern German Reader, Part I* (4); Genung's *Hand-Book of Rhetorical Analysis*; Sallust's *Catiline*, Allen and Greenough (4).

Practicums (10).—Free-Hand Drawing (6), English (4).

WINTER SESSION.

MATHEMATICS.—Trigonometry, Wheeler (5).

LANGUAGE.—French or German, English or Latin—Whitney's *Grammar, Part I, completed*; *Historiettes Modernes* (Fontaine); Otis' *Elementary, Part II*; Storm's *Immensus*; Stifter's *Haidedurf* (5).

Genung's *Practical Rhetoric* (4); Lavy *Early Roman History or Hannibalic Wars* (5).

MILITARY TACTICS.—U. S. *Infantry Drill Regulations* (1).

Practicums (10).—Free-Hand Drawing (4), Carpentry (6).

SPRING SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (5).

LANGUAGE.—French or German, English or Latin, *Sept Grands Auteurs du XIXme Siecle* (Fortier); *Novellen Bibliothek* (Bernhardt) (5); Morris' *Specimens of Early English, Part I* (3); Tacitus—*Germania and Agricola* (3).

HISTORY.—Fisher's *Outlines Ancient* (3).

Practicums (10).—Free-hand Drawing (4), English (4), Plant Study (2).

Sophomore Year.

FALL SESSION.

MATHEMATICS.—Analytic Geometry, Nichols (4).

LANGUAGE.—French or German, Luquien's *French Prose of Popular Science*; Hodges' *Scientific German* (4).

CHEMISTRY.—*Lectures on the Non-Metals* and Harris' *Lecture Notes on General Chemistry* (5).

HISTORY.—Fisher's *Outlines—Medieval* (3).

Practicums (8).—Chemistry (4), Dissection (4).

WINTER SESSION.

BIOLOGY.—General, Parker's *Elementary Biology* (3).

LANGUAGE.—French or German, Super's *Historical Readings*; Gore's *German Science Reader* (2).

CHEMISTRY.—*Lectures on the Metals* and Harris' *Manual of Qualitative Analysis* (3).

HISTORY.—Fisher's *Outlines—Modern* (4).

Practicums (10).—Chemistry (8), Biology (2).

SPRING SESSION.

GENERAL BIOLOGY.—Parker's *Elementary Biology* (4).

LANGUAGE.—French or German, Chateaubriand's *Atala*; Rene and Le Dernter *Abencerage*; Kellas' *Die-togen* and Freytag's *Soll und Haben* (4).

CHEMISTRY.—The same as winter session (3).

Practicums (16).—Chemistry (12), Biology (4).

Junior Year.

FALL SESSION.

BIOLOGY.—Bastin's *College Botany* (4); Gray's *Anatomy* (5).

PHYSICS.—Mechanics, Lodge; and Electricity, Poyser (4).

Practicums (14).—Physical Measurements (4), Botany (6), Human Anatomy, (4).

WINTER SESSION.

BIOLOGY.—Botany, Bastin and *Lectures* (4); Histology, Schafer (5); Advanced Physiology, Mart, (2).

PHYSICS.—Sound, Stone; Light, *Lectures* and Deschanel (4).

Practicums (10).—Physical Laboratory (4), Botany (6).

SPRING SESSION.

BIOLOGY.—Phenogamic Botany (4); Zoology, *Lectures* (4); Physiology, Martin, *Advanced Course* (3).

PHYSICS.—Heat, Garnett (4).

Practicums (10). Physical Laboratory (4), Mineralogy (4), Physiology (2).

Senior Year.

FALL SESSION.

BIOLOGY.—Zoology, *Lectures* (4).

GEOLOGY.—Dana (4).

PSYCHOLOGY.—Hoffding's *Outlines* (3).

ECONOMICS.—Walker's *Political Economy* (4).

Practicums (10). Zoology (4), Geology (6).

WINTER SESSION.

BIOLOGY.—Theory of Evolution, Conn (3), Embryology, Foster and Balfour (3), Plant Physiology, *Lectures* (2).

GEOLOGY.—Dana (3).

POLITICAL SCIENCE.—Cooley's *General Principles of Constitutional Law* (4).

Practicums (10).—Zoology (4), Embryology (6).

SPRING SESSION.

BIOLOGY.—Advanced Problems, *Lectures* (5), Forestry, *Lectures* (3), Anthropology, *Lectures* (2).
 POLITICAL SCIENCE.—Woolsey's *International Law* (5).
Practicums (10).—Graduation Thesis.

COURSE IN CHEMISTRY.

The studies of the first two years in this Course are the same as in the General Science or the Latin-Scientific Course.]

Junior Year.

FALL SESSION.—Theoretical Chemistry, *Remsen's* (3), Quantitative Analysis (1), Physics, Mechanics, Lodge; Electricity, Poyser (4), Integral Calculus, *Taylor* (2).
Practicums.—Physical Measurements (4), Chemistry, Quantitative Determinations, Gravimetric and Volumetric (16).
 WINTER SESSION.—Theoretical Chemistry, *Remsen's*, and Organic Chemistry, *Lectures* (3), Quantitative Analysis (1), Physics, Sound, Stone; and Light, *Lectures* and Deschanel (4).
Practicums.—Physics (4), Chemistry, Quantitative Separations and Complete Analysis of Alloys, Minerals and Commercial Products (20).
 SPRING SESSION.—Organic Chemistry, *Lectures* (3), Physics, Heat, Garnett (4), French or German (1), Ethics, Bowne's (5).
Practicums.—Chemistry, Work of winter session continued (8), Mineralogy (6).

Senior Year.

FALL SESSION.—Chemistry, *Special Topics, Lectures*, (4), Geology, *Dana* (4), Political Economy, *Walker* (4).
Practicums.—Chemistry: Analysis of Iron and Steel and Organic Preparations (16).
 WINTER SESSION.—Chemical Technology, *Wagner* (3), Constitutional Law, *Cooley's General Principles* (4).
Practicums.—Chemistry: Organic Preparations continued and Organic Analysis, including Analysis of Water, Urinary Analysis and Toxicology (26).
 SPRING SESSION.—Chemical Technology, *Wagner* (3), International Law, *Woolsey* (5).
Practicum.—Chemistry: Ultimate Analysis and Sanitary Chemistry (24), Graduation Thesis.



